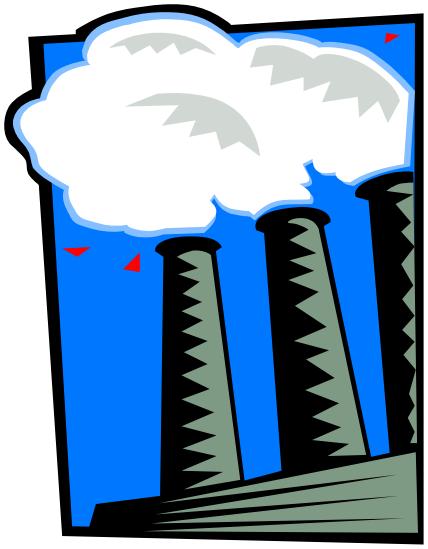
A Collaborative Report Presenting Air Quality Strategies for Further Consideration by the State of New Jersey



Prepared By
The Stationary Combustion Sources Workgroup

October 31, 2005

The Stationary Combustion Sources Workgroup Report
October 31, 2005

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Executive Summary: Stationary combustion sources have been identified as a point source category with the potential for reducing air pollutants to help meet the new federal health-based standards for eight-hour Ozone and Fine Particulate Matter. These stationary pieces of equipment include combustion units such as boilers, gas turbines, emergency generators, and other fuel burning equipment. These "major" point sources constitute substantial portions of total statewide sulfur dioxide (SO_2) and nitrogen oxides (NO_x) emission inventories and also contribute to the volatile organic compounds (VOC) and fine particulate matter ($PM_{2.5}$) emission inventories. Refer to Appendix 3.

Thus, the Stationary Combustion Sources (SCS) Workgroup identified potential control measures to reduce SO_2, NO_x, PM, and VOC emissions for possible inclusion in the State Implementation Plan. Through the cooperative efforts of the State of New Jersey, federal agencies, industry, consultants, environmental groups, and other members of the regulated community, the Workgroup (see Appendix 1) evaluated available emission inventories, technical information and field data to develop a list of potential air emission control strategies. The top five most promising control measures recommended by this Workgroup to the New Jersey Department of Environmental Protection (NJDEP) for further consideration are as follows:

1. Water injection for simple cycle aeroderivative gas turbines
2. Uniform lower sulfur content limits for fuel oil
3. Biodiesel fuel
4. Fuel switching (No. 6 fuel oil to No. 2 fuel oil)
5. Operational flexibility in use of newer, cleaner combustion units over older, less efficient, higher emitting units

These emission reduction strategies are further described in Section VI of this report. A complete listing of all control measures discussed by the SCS Workgroup appears in Appendix 2.

The Stationary Combustion Sources Workgroup Report
October 31, 2005

I. Introduction

The NJDEP hosted an Air Quality Workshop at the Trenton War Memorial on June 29, 2005. Stationary combustion sources (SCS) were identified as a point source category with the potential for substantial reductions of air pollutants to help meet the new federal National Ambient Air Quality Standards (NAAQS) for eight-hour Ozone and Fine Particulate Matter ($PM_{2.5}$). Thus, the Stationary Combustion Sources Workgroup, one of six workgroups, was formed to identify potential control measures to reduce sulfur dioxide (SO_2), nitrogen oxides (NOx), particulate matter (PM), and volatile organic compounds (VOC) emissions for possible inclusion in the State Implementation Plan (SIP). Through the cooperative efforts of the State of New Jersey, federal agencies, industry, consultants, environmental groups, and other members of the regulated community, the SCS Workgroup (see Appendix 1) evaluated available emission inventories, technical information and field data to develop a list of potential air emission control strategies. The top five most promising control measures recommended by this Workgroup to the NJDEP for further consideration are as follows:

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3. Biodiesel fuel
4. Fuel switching (No. 6 fuel oil to No. 2 fuel oil)
5. Operational flexibility in use of newer, cleaner combustion units over older, less efficient, higher emitting units

These control measures are further described in Section VI of this report. After deliberation of the merits of all ideas identified by the Workgroup, the most favorable reduction strategies were chosen through popular decision. The suggestions receiving the highest number of votes became the top recommendations. A complete listing of all control measures discussed by the SCS Workgroup appears in Appendix 2.

Stationary combustion sources are those stationary pieces of equipment considered major sources and may include combustion units such as boilers, gas turbines, emergency generators, and other fuel burning equipment. These point sources constitute substantial portions of total statewide SO_2 and NOx emission inventories and also contribute to the VOC and $PM_{2.5}$ emission inventories as illustrated by the 2002 Emission Inventory charts found in Appendix 3.

II. Purpose and Goals

The purpose of this Workgroup was to identify potential strategies to control or reduce SO_2, NOx, PM, and VOC emissions for further study. Specifically, the SCS workgroup was tasked with identifying viable methods to reduce air contaminant emissions from electric generating units (EGUs) and non-electric

generating units (non-EGUs), along with pros and cons of those options, as a first step in addressing new $PM_{2.5}$ and eight-hour ozone NAAQS.

The NJDEP sought reasonable and effective control measures that impact any of the four Ozone and $PM_{2.5}$ precursors: VOCs, NOx, SO_2 and direct $PM_{2.5}$. The SCS Workgroup identified the most promising areas where further examination of emission reduction opportunities should be focused for possible inclusion in the SIP. The NJDEP also requested additional sources of data to enhance the State's database of air quality information.

All members of the Workgroup were encouraged to provide "white papers" on potential emission reduction strategies to assist the NJDEP in its subsequent deliberations on measures to include in the SIP.

Finally, this workgroup process is an early stage in the development of the SIP. The NJDEP expects that many Workgroup members will continue to be active in developing and commenting on both the proposed emission control measures and the detailed implementation plan, including any related rule proposals.

III. Structure of Workgroup

The Workgroup opted to remain intact rather than splitting into two subgroups, electric generating units (EGUs) and non-electric generating units (non-EGUs). The consensus was that the consolidated efforts of the group as a whole would promote dialogue and foster a wider range of ideas for emission reduction strategies. However, there was an opportunity during the workgroup's August meeting to break out into one of three discussion groups, EGUs (electric generating units), Fuel Switching and Biodiesel. Discussions followed presentations in these target areas and were led by DEP Lead Team members, Yogesh Doshi, Danny Wong and Melissa Evanego, and Serpil Guran, respectively.

IV. Summary of Meetings/Conference Calls/Data Reviewed

This workgroup has met five times between the June 29, 2005 Air Quality Workshop and September 27, 2005. Refer to Appendix 4 to view the meeting summaries. The initial meeting immediately following the workshop was formative and provided participants with the Workgroup's mission, goals, and ground rules to stay on task. The participants decided on Trenton as a central location for future meetings.

The second meeting held on July 12 was an informative meeting to provide and discuss additional information, inventory data and source categories requested

by the workgroup members at the initial meeting. (See the list of inventory data in Appendix 5.) The group began to identify viable categories for potential emission reductions.

The August 9 meeting was an all-day session with presentations on possible control measures and reduction strategies in the morning followed by break out discussion groups in the afternoon. The groups (EGUs, Fuel Switching and Biodiesel) discussed the morning's presentations and evaluated the relative environmental benefits, economic/cost impacts, and potential implementation issues of various emission reduction methods. Afterwards the Workgroup reconvened and each break out group reported the results of their discussions. The master list of potential control measures was finalized based on the break out groups' deliberations.

At the next meeting, on September 13, ways of ranking all the recommendations listed in the summary table of control measures (shown in appendix 1) were weighed. The Workgroup's top five recommendations that would best provide for significant reductions were ultimately chosen by popular vote. Refer to the Executive Summary for the top five recommendations.

Last, the participants convened on September 27 to critique the preliminary draft report summarizing the Workgroup's deliberations and recommendations. The preliminary draft report was distributed at the beginning of the meeting.

V. Initial Workgroup Control Measure Considerations

A. Discussion of how the workgroup focused its analysis on viable categories within the scope of the workgroup

Presentation and review of data inventory and examination of stationary combustion source categories triggered reaction and speculation among the participants. Subsequent presentations about various emission reduction strategies, some actual and others hypothetical, also generated in-depth discussion and analysis.

B. Discussion of the Control Measure Evaluation Process

The criteria used by the workgroup to evaluate control measures included technical feasibility, economic feasibility, environmental benefits, and implementation feasibility.

C. Review of all measures evaluated by the workgroup based on the criteria in Section B.

Reduction strategies examined by the Workgroup during this initial analysis are listed in tabular form in Appendix 2, Stationary Combustion Sources Potential Control Measures. This table includes every idea suggested by participants within the scope and purpose of the SCS Workgroup.

VI. Detailed Review of Promising Control Measures

A. The Workgroup's top five emission control measures recommended for further study were chosen by popular vote.

1. Water Injection for Simple Cycle Aeroderivative Gas Turbines

In New Jersey, electricity is mainly produced by nuclear reactors, coal-fired boilers, and oil and gas-fired stationary combustion turbines. Since nuclear reactors do not emit criteria air pollutants when producing electricity, the Workgroup did not focus its discussions on this source category. Coal-fired boilers are either already equipped with the State of the Art (SOTA) control technology, or are expected to install SOTA control technology in the near-term to reduce NOx, SO_2, and PM emissions through enforceable agreements with the Department and other government agencies. Therefore, further reduction measures for coal-fired boilers were not addressed by the Workgroup.

The Workgroup discussed oil and gas-fired stationary gas turbines at length. There are two main types of stationary combustion turbines used for electricity generation: combined cycle and simple cycle. In New Jersey, the existing combined cycle turbines are generally newer and, therefore, generate less overall air pollution per unit of energy produced than the simple cycle turbines. Combined cycle turbines have higher fuel efficiency, but lack quick-start capability compared to simple cycle turbines. The combined cycle turbines tend to serve a "load-following" mission, meaning that their electric outputs fluctuate with changes in electric demand.

Conversely, simple cycle turbines are primarily used as "peaking units," i.e., they are generally the last units dispatched during periods of peak load when electrical demand is at its greatest. The quick-start capability of these peaking units assists in grid stabilization. The operation of simple cycle turbines is less efficient and, therefore, produces higher rates of pollutant emissions per unit of energy produced. Simple cycle peaking units operate primarily on hot summer days when exceedances of the Ozone NAAQS also occur. On such days, these units may account for a substantial fraction of stationary combustion source NOx emissions. The Workgroup mainly focused its discussion on simple cycle

turbines, due to their significant potential for NOx emission reduction and its corresponding effect on ozone non-attainment. (See Charts in Appendix 3.)

There are two categories of simple cycle turbines, aeroderivative and industrial, or frame-type, turbines, the aeroderivative-type being more common in New Jersey. About one third of the older aeroderivative-type turbines have been retrofitted with water injection for NOx emission control with demonstrated NOx emission reductions of at least 40%. Water injection involves the injection of demineralized (DM) water into a turbine's combustor, which lowers peak flame temperature and reduces the formation of "thermal" NOx emissions. Based on field experience, installing water injection on the remaining simple cycle turbines not equipped with other NOx control is technically feasible. Currently, there are over 80 such turbines in New Jersey which are not equipped with water injection.

With water injection, for an engine operating about 12 hours per day during peak demand, reductions of about 0.5 tons of NOx per day can be achieved. This technology has the promise of reducing 40 tons of NOx per ozone season day overall, if it is installed on all existing simple cycle aeroderivative-type turbines not currently equipped with it. A downside to this method of NOx reduction is the equivalent amount of higher CO emissions produced. CO, however, is only a potential problem in the winter months, and attainment with the NAAQS for CO has been achieved statewide. Therefore, higher CO emission is not of significant concern. Moreover, this control technology involves, by one estimate, annualized cost of about $44,000 per ton of NOx reduction (Refer to presentations by Conectiv and PSEG cited in Appendix 5). These costs can vary significantly depending on a turbine's baseline NOx emissions, utilization level, and other site-specific factors, such as existing DM water storage capacity.

2. Low Sulfur Fuel

Sulfur content in fuel oil is regulated under N.J.A.C. 7:27-9, commonly referred to as "Subchapter 9." Depending on a source's geographic location, or zone, within the State, the regulated sulfur content limits ranges from 0.2% to 0.3% by weight for No. 2 fuel oil, and from 0.3% to 2.0% by weight for No. 6 fuel oil. The SCS Workgroup proposes lowering the sulfur content limits for No. 2 and No. 6 fuel oil through a revision to Subchapter 9. The proposal discussed by the Workgroup entails the adoption of uniform, lower sulfur content standards for these types of fuel oil.

There are stationary combustion sources in New Jersey that currently burn No. 2 grade fuel oil with 0.05% sulfur by weight, and No. 6 grade fuel oil with 0.3% sulfur by weight, without compromising efficiency. Sources switching from 0.2% to 0.05% sulfur in No. 2 fuel oil would potentially result in a 75% reduction in SO_2 emissions, or approximately 253 tons/year Statewide. For No. 6 fuel oil sources in New Jersey, switching from 2.0% to 0.3% sulfur content in this grade fuel

potentially reduces SO_2 emissions by 85%, or approximately 829 tons/year. This initiative would impact not only the point sources, but also the area sources such as home heating yielding even greater reductions of SO_2 emissions.

A significant implementation issue requiring further study would be if refineries could meet the demand for the lower sulfur fuel oil. Workgroup members representing refineries indicated that producing sufficient quantities of 0.3% No. 6 fuel oil should not be a problem. However, the supply/demand situation with regard to production of 0.05% No.2 fuel oil is an area for further evaluation.

3. Biodiesel

There is sufficient evidence that many health problems can be associated with adverse affects of diesel emissions. The United States Environmental Protection Agency (USEPA) has classified diesel exhaust as likely to be carcinogenic to humans by inhalation at environmental exposures. The USEPA has also identified diesel particulate matter and diesel exhaust organic gases as air toxics. Blending biodiesel with petroleum diesel at several percentages would, however, reduce the adverse affects of diesel exhaust emissions, and therefore, the Workgroup suggests biodiesel initiatives be considered for further examination.

Biodiesel can be produced from soybean oil and other oilseed crops. Biodiesel can also be produced from waste yellow and brown greases. Yellow grease is spent cooking oil and brown grease is collected from grease traps in commercial, industrial or municipal sewage facilities that separate grease and oil from wastewater.

The use of 100% biodiesel (B100) and biodiesel blends (e.g. B20) offer many benefits including:

a. reduced exhaust emissions including carbon monoxide (CO), sulfur, hydrocarbons (HC), polynuclear aromatic hydrocarbons (PAH) and PM
b. reduced health risks associated with diesel exhaust
c. reduced greenhouse gas emissions
d. decreased dependence on petroleum imports
e. developing new markets for agricultural products such as soybeans**.**

There are new findings that blending biodiesel with ultra low sulfur diesel would not increase, and may decrease, NOx emissions if the blend is used for transportation (Rowan University). Experimental data show that when biodiesel is blended with home heating oil, NOx emissions would be reduced by 20% (Brookhaven National Lab.). Recent tests showed that B10 combustion in a 1999 Caterpillar engine reduced NOx emissions by 12.9% (Iowa Association of Municipal Utilities (IAMU) and Iowa Department of Natural Resources (IDNR)).

4. Fuel Switching

Fuel switching, i.e., from heavier to lighter fuel oil, was tagged as a possible control measure for further consideration after an informative PowerPoint presentation by one of the participants (see August 9, 2005 Hoffmann-La Roche presentation materials in Appendix 5) and subsequent discussions at the Fuel Switching break out session. The goal would be to require facilities currently burning No. 6 fuel oil to switch to No. 2 fuel oil.

The potential environmental benefits of fuel switching could be a 64% reduction in both SO_2 and NOx emissions from current levels of the fuel oil sources, or 1,245 tons/year and 596 tons/year, respectively. The potential reduction of PM may be 71%, or 34 tons per year.

This control measure is technically feasible based on available data from facilities that have already made the switch from No. 6 fuel oil to No. 2 fuel oil. However, there are costs associated with fuel switching such as retrofitting the equipment and cleaning or replacing existing fuel oil tanks. One case study in New Jersey estimated the potential cost of fuel switching to be $33,000/ton of SO2 emission reduction. However this figure does not take into consideration the reduced maintenance costs associated with switching to cleaner fuel including elimination of tank heaters and reduction of boiler foul-up. While it is possible that several large sources which consume up to 74% of No. 6 fuel oil used during the ozone season may be considered for retirement, this option should still be pursued further due to its potential benefits with respect to NOx and PM $_{2.5}$ emission reductions.

5. Operational Flexibility

The Workgroup recommended further study of an emission reduction strategy to provide increased operational flexibility to newer, more efficient, and lower emitting combustion units over older, less efficient, higher emitting units. Workgroup members identified provisions, more prevalent in air permits for newer, “cleaner” units, that disfavor or prevent operation of these units, and in turn result in operation of older, higher emitting units that tend to have less restrictive permits. For example, capacity factor restrictions imposed on newer, “cleaner” turbines through the air permitting process have temporarily “idled” these units at times, and resulted in the operation of older, higher-emitting turbines to make up the lost power. Fuel use limits expressed on a 365-day rolling basis were also cited as an obstacle to operation of newer, cleaner units. This change would require revision to the source’s Title V permit. Use of newer, cleaner combustion units over older, less efficient units may reduce NOx emissions on hot summer days when exceedances of the ozone standard are most likely to occur. Refer to NJ EGU pie chart in Appendix 3.

VII. Summary of "Parking Lot" and Crossover Issues

A. "Parking lot" issues discussed that were not directly related to the evaluations of a control measure, but are related to the stationary combustion sources under review by this group follow:

1. Restrict oil usage on ozone alert days
2. More stringent compliance criteria with NOx allowances for "excess" NOx emissions.
3. No stack testing when units are not ordinarily running
4. Schedule stack testing outside the ozone season
5. Concerns that retrofits and equipment upgrades may trigger New Source Review (NSR), SOTA, or other regulatory requirements
6. Options to help implement control measures, if adopted, and to provide incentives to help decrease the cost of retrofits and upgrades
7. Options to help expedite and streamline the air permitting processes required to implement control measures
8. Provide more education and assistance to smaller institutional facilities, such as hospitals and apartment complexes regarding control measures, retrofits and upgrades
9. Synergies Between NJBPU Energy Efficiency / Renewable Energy Initiatives and NOx Reductions

a) The New Jersey Board of Public Utilities' (NJBPU) Office of Clean Energy (OCE) is implementing energy efficiency / renewable energy programs in New Jersey which support the New Jersey Department of Environmental Protection's (NJDEP) NOx reduction goals. Specifically, these EE/RE programs increase the total percentage of electricity derived from renewable technologies which have reduced air emissions (biomass, landfill gas, POTW gas) or zero emission (solar photovoltaics) versus the PJM average for electric generation units. Two of these programs are established through the Electric Discount and Energy Competition Act (EDECA), NJSA 48:3-49 et. seq., and one program – the Regional Greenhouse Gas Initiative (RGGI), is a joint undertaking of the NJDEP and NJBPU. Specific policies include:

(1) The Renewable Portfolio Standard (RPS). The RPS in New Jersey currently requires 6.5% of the total electricity sold in NJ be derived from qualified renewable resources by 2008, with a recommendation of a 20% goal by 2020

(2) The Energy Efficiency program of the NJBPU, that utilizes roughly 2/3 of the funding provided through the Societal Benefits Charge in NJ to fund energy efficiency projects to reduce growth in electricity demand in NJ

Finally, the NJDEP and NJBPU Agency Heads are actively involved in the design and implementation of the RGGI program, which will place a cap on carbon dioxide (CO2) emissions from power plants in the participating Mid-Atlantic and Northeast states. Goals of the two New Jersey agencies in increasing the

amount of power derived from renewables, and use of allowances under the RGGI program to incent energy efficiency, are being interwoven into the operating guidelines for RGGI.

The over-arching benefit of these NJDEP and NJBPU policies in supporting NOx reductions is derived through maximizing renewable energy production, and reducing increases in electricity demand, in New Jersey. Electricity production and consumption has attendant, environmental impacts. Wherever cleaner production, and avoided generation can be achieved, all attendant air contaminants emitted by electric generation units (including NOx) emissions are achieved.

B. Crossover issues are those topics discussed by a workgroup that may be within the scope and mission of other workgroups as well (i.e., Diesel Initiatives, Gasoline Cars and Trucks, Non-automobile Gasoline Engines, Volatile Organic Compounds, and Homes and Restaurants). Crossover issues that were discussed by this Workgroup included lower sulfur fuel oil and biodiesel fuel.

VIII. Comments

In general, the Workgroup offered the following recommendations, observations and feedback:

1. Promotion of tax incentives or financial incentives to cover the cost of new technology
2. Overall consideration needs to be given to balance the need of energy and protection of the environment
3. Unpredictability of available fuel and pricing - there was speculation regarding the potential for an increase in the price of #2 fuel oil in response to an increase in demand. In turn this may lead to a shortage of #2 fuel oil thereby creating an abundance of #6 fuel oil
4. Multi-media considerations such as the availability of water
5. Consideration needs to be given for trade-offs between pollutants, i.e., when a technology employed to reduce one may increase another
6. Willie Nelson's tour bus runs on vegetable oil
7. Additional time required for better analysis of more stationary combustion sources
8. Positive feedback received regarding sharing information and networking
9. Mixed opinions but most indicate a degree of confidence that this process will result in control strategies
10. Breakout sessions were very beneficial allowing for free exchange of ideas with promising results
11. Information on biodiesel and NJBPU programs most beneficial
12. Appreciation for open discussion of various reduction strategies and opportunity to be a part of the regulatory process
13. Formally present recommendations (PowerPoint presentation) to Commissioner followed by written report

IX. References

1. California Energy Commission. Implementing California's Loading Order for Electricity Resources, Staff Report, July 2005,CEC-400-2005-043.

2. U.S., Department of Environmental Protection Agency, Stationary Source Control Techniques Document for Fine Particulate Matter, October 1998, EPA Contract No. 68-D-98-026, Work Assignment No. 0-08.

3. "Biodiesel." Stationary Combustion Sources Workgroup, Reducing Air Pollution Together, New Jersey Department of Environmental Protection. August 9, 2005. [http://www.nj.state.gov/dep/airgroups/combustion_workgroup.html], accessed September 29, 2005.

X. Additional Information Submitted from Individual Members of the Workgroup

A. Integrated Gasification Combined Cycle (IGCC), NJBPU

Process that converts coal into a "syngas" that is used to fuel a combustion turbine to generate electricity. The exhaust heat from the combustion turbine is used to produce steam for a second generation cycle and provide steam for the gasification process. The syngas is predominantly hydrogen and carbon monoxide and is referred to as a clean coal technology. IGCC provides the following benefits:

a) Electricity generation from coal
b) IGCC operates at a higher efficiency than a conventional coal-fired power plant
c) Can be used as a feedstock in commercial chemical industry
d) Can produce hydrogen for NJ's developing fuel cell industry
e) Transportation fuels
f) Sulfuric acid off-gas can be used in fertilizer production

Environmental benefits include lower emissions of NOx, SOx, PM10, Carbon Dioxide than conventional coal-fired generation exceeding new source emissions standards; can achieve up to 99 percent mercury control (current plants achieving 90-95% at much lower cost than conventional coal-fired generation). IGCC requires 30 to 60% less water usage than conventional coal-fire generation. It does not produce fly ash and the resultant slag is non-leachable suitable as road aggregate, backfill, or landfill cover.

B. Hydrogen Economy, NJBPU

State of New Jersey
Board of Public Utilities
Two Gateway Center
Newark, NJ 07102

Michael Winka, Director
Office of Clean Energy

Tel. # (609) 777-3312
Fax # (609) 777-3336

MEMORANDUM

To: Doyal Siddell

From: Mike Winka

Re: New Jersey Hydrogen Learning Center (NJH_2LC) Talking Points

Date: September 14, 2005

Basically OCE is funding Rutgers to explore next steps in developing a Hydrogen economy in NJ. Rutgers will explore what College and University programs need to be developed to deliver E/S into the hydrogen market. OCE is attempting to define the infrastructure needed to be developed if a Hydrogen economy is to come to pass in NJ. The development will be partner with likely entities such as, BOC Gases, local refiners, RE, and others. This is done in conjunction with other NJ state Colleges and Universities, and the Mid Atlantic Hydrogen Cooperative.

To start from the beginning, BPU's Office of Clean Energy received an annual Grant Award from the US Dept. of Energy entitled "State Energy Program Grant(SEP)". Of the total award for SFY2005, $250,000 was allocated by BPU for a Project entitled "Hydrogen Infrastructure". Through Rutgers University, Center for Energy Economic and Environmental Policy, Edward J. Bloustein School(University) a project entitled

"Creating a Hydrogen Learning Center in New Jersey" was created over a one year period.

The University will establish a learning center with those New Jersey Colleges and Universities with fuel cell facilities. They include: Rutgers-Cook College EcoComplex; Ramapo College; The College of New Jersey; Stockton State College; and Ocean County Community College.

The New Jersey Hydrogen Learning Center (NJH_2LC) will further the NJ Board of Public Utilities goals to contribute to the state's consideration of the role of hydrogen and to foster and promote the use of alternative and renewable fuels. The NJH_2LC will help to:

1. Involve and integrate New Jersey's colleges and universities in hydrogen activities and the development of a hydrogen economy;
2. Use the existing hydrogen fuel cell assets deployed at various New Jersey colleges and universities as demonstrations for education and networking;
3. Educate New Jersey's high school and undergraduate students in the basics of hydrogen and fuel cells concepts;
4. Enhance participation of hydrogen, fuel cell and related businesses and other hydrogen stakeholders in state energy, economic and environmental policymaking;
5. Develop greater understanding of hydrogen and fuel cell issues among municipal and county officials.
6. Enhance and increase the dissemination and exchange of ideas and information among all stakeholders; and

By designing the NJH_2LC as a distributed center, participating colleges and universities will play an integral role in the state's hydrogen activities, helping to achieve the first objective.

The NJH_2LC's activities represents the next steps on the path for policymakers and other stakeholders to make an informed decision whether New Jersey will take a leading or adaptive role in the emerging hydrogen economy.

BPU will require the NJH2LC to deliver the following tasks:

1. Task 1-To provide Four (4) NJH_2LC Quarterly Status Reports

2. Task 2 – Create a hydrogen and fuel cell instructional modules for high school and undergraduate student curricula
3. Task 3 – Build a hydrogen and fuel cell network among stakeholders
4. Task 4-Develop a Hydrogen website at CEEEP (e.g. www.njhydrogen.com)

5. Task 5-Facilitate quarterly hydrogen network meetings (hosted by NJH_2LC partners)

6. Task 6 – Develop an education and training module for municipal and county officials on hydrogen and fuel cells

In addition the OCE has supported the following projects in hydrogen technology. In 2003, just under $2,700,000 in grants were awarded or committed to ten renewable energy businesses as part of the OCE's REED (Renewable Energy and Economic Development) Program. The grants are intended to promote renewable energy business development in the State. The list below identifies the recipients, the amount of each award and describes the three hydrogen project for which the grant was awarded.

Advanced Power Associates - $119,000.00 – Developed a power conditioner that will allow solar electric and wind power to be used in electrolyzes for the generation of hydrogen and in automotive fuel cell applications.

Reaction Sciences Inc. - $297,660.00 – Development of thermo-chemical hydrogen technology and the demonstration of the technology in a pilot scale solid oxide fuel cell.

Resource Control Corp. - $225,000.00 – Demonstration and commercialization of an integrated system that produces hydrogen from photovoltaic panels, onsite hydrogen storage and fuel cell integration. This system will provide the complete power for a typical home and has multiple off-grid applications.

I conclude that the OCE looks forward to working with Bloustein in developing the above aforementioned goals. The overall motivation is move our energy dependence away from fossil fuels to a more stable energy source. This in turn will benefit the state overall economy.

C. Sewer Sludge Incinerators, Association of Environmental Authorities

ASSOCIATION OF ENVIRONMENTAL AUTHORITIES
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DEP Stationary Combustion Sources Workgroup
October 7, 2005

Proposal:

Lower afterburner exhaust temperature.

Control Measure Description:

Reduce the afterburner temperature requirement for sewage sludge incinerators. Demonstrations have shown that both the CO and Non-Methane Hydrocarbon emissions limits can be continuously met with an afterburner temperature substantially below the present NJDEP policy of 1500°F.

Discussion of Pros:

1. Reduced natural gas and fuel oil consumption.
2. Reduced dependence on foreign energy sources.
3. Reduced maintenance cost for the fired equipment.
4. No cost to retrofit.
5. Reduced CO_2 emissions.
6. No increase in stack emissions.
7. Installed CEMS will assure continued compliance.

Discussion of Cons:

1. Stack testing may be required to demonstrate that other combustion related parameters are being met.
2. Permit modifications will be required for all sludge incinerators in the state.

Thank you for your consideration,

Ellen Gulbinsky
Executive Director

APPENDICES:

Appendix 1: Stationary Combustion Sources Workgroup Participants

Workgroup Non-State Team Members:

Brian Bahor, Covanta Projects Inc.
Rich Bankowski, Rutgers University
Anna M. Borillo, NJ Transit
Arlene Borowsky, ENSR Int'l
Kyle Boudreaux, Florida Power & Light
Mark Caine, Bristol-Myers Squibb
Luis A. Comas, Sunoco
Scott M. Conklin, Ocean County Utilities Authority
James Connolly, Hoffman-LaRoche, Inc.
Bill Corbin, Wheelabrator Gloucester
Michael Cullen, PSEG – Hudson
Daniel Cunningham, PSEG
Howard Ellis, Enviroplan
Lisa Fleming, Vineland
Tom Frankiewicz, Ozone Transport Commission
Ted Gardella, USEPA
Milt Grundlock, Gloucester County Utilities Authority
Kevin Harren, Valero Refining Co. Paulsboro
Al Hatton, Environmental Resources Management
Christine Heath, Trinity Consultants
Gary Helm, Conectiv Energy
William Hizny, Engelhard Corp
John Hoertz, AFCEE/CCR-A
Carleen Houston, Federal Aviation Administration Tech. Center
Pat Kittikul, Amerada Hess Corp.
Fran Lindsley-Matthews, Chevron
Rudy Maes, ESMI of NJ
Chris McClure, Clough Harbor Association LLP
Kim McDonald, Air Force (McGuire Air Force Base)
Kelly Moretta, Schering Plough Corp
Gary Napp, EnviroMet
Christine Neely, PSEG
Karen Nowicki, AEANJ
Keith Ocheski, EnviroMet
Jon Perry, PSEG
Tim Porter, Wheelabrator
Richard Rao, Terranext
Michael Tsakaloyannis, Clough Harbor Association LLP
Bill Vasil, Terranext
Manny Vizcaya, Air Engineering
Sarah Woo, US Army (Fort Dix)

Workgroup State Team Members:

NJDEP Division of Air Quality, Bureau of Preconstruction Permitting
Yogesh Doshi, Leader
NJDEP Division of Air Quality, Bureau of Air Quality Planning
Melissa Evanego, Tom McNevin and Danny Wong (Co-facilitator)
NJDEP Division of Air Quality, Bureau of Operating Permits
Peg Gardner (Co-facilitator)
NJDEP Division of Science, Research & Technology, Bureau of Sustainable Communities & Innovative Technologies
Serpil Guran and Joe Carpenter
NJDEP Division of Air Compliance & Enforcement. Southern Regional Office
Richelle Wormley and Matt Zehr
NJBPU Office of Clean Energy
Scott Hunter, Ronald Jackson, and John Zarzycki

Appendix 2: STATIONARY COMBUSTION SOURCES – Possible Control Measures

Proposal	Control Measure Description	Criteria for Consideration	Discussion Pros	Discussion Cons
Fuel switching	Switch from #6 fuel oil to #2 fuel oil.	Technical Feasibility	Has been done by NJ facilities.	Most likely need to retrofit boiler/burner to burn different oil; Retrofit may trigger NSR, SOTA, or other regulation requirements; Would either have to clean up the existing tanks or altogether get new tanks; May cause a shortage of #2 oil and no market for #6 oil.
		Economic Feasibility	Lower maintenance cost (no tank heaters, less boiler foul up, etc.).	Cost of retrofit; Cost of cleaning/removing existing tanks and putting in new tanks (piping/fitting); Price of fuel dictates type of fuel used (higher cost of #2 fuel vs. #6 fuel); Cost differential may increase due to increased demand for #2 fuel oil; Potential cost of $33,000/ ton of reduction (this is for a specific facility in NJ).
		Environmental Benefits	Potential reduction of 28.9 tpy SO2, 32.0 tpy NOx, and 7.9 tpy PM (this is for a specific facility in NJ). This is more for PM than ozone issue. Some GHG benefits.	

		Implementation Issues	State should provide incentives to switch; educate and give more assistance to the smaller facilities (apartments and hospitals).	
SCR	Selective Catalytic Reduction. For simple cycle turbine, combined cycle turbine, non-coal large boilers, and non-coal small boilers.	Technical Feasibility	Technology readily available; ammonia handling may be mitigated by use of urea.	Need lots of space; ammonia handling and storage; thermal shock at peaking units; not feasible for “spinning reserve” units.
		Economic Feasibility		Much more expensive than water injection. For oil-fired combustion units, there is fouling of catalyst and shortened catalyst life.
		Environmental Benefits	~95% control efficiency for NOx.	Ammonia and increased PM emissions; higher CO2 emissions due to reduced efficiency.
		Implementation Issues		
Water injection	Demineralized (DM) water is injected into turbine combustion zone to reduce peak flame temperatures & control “thermal NOx” formation. For currently uncontrolled simple cycle aeroderivative turbines.	Technical Feasibility	Technology readily available.	Availability of water; Retrofit and other equipment needs; space.
		Economic Feasibility		Cost of retrofit and other equipment needs; $44,000/ton of NOx reduced (average cost for 11 units in one case study in NJ).
		Environmental Benefits	> 40% reduction in NOx; 35 - 40 tpd reduction of NOx.	Potential change in efficiency due to the heat required to vaporize the injected water
		Implementation Issues		Use at “unmanned” turbine sites presents increased operational difficulties
Low NOx burner (DLN)	For simple cycle turbine, combined cycle turbine, boilers, and others.	Technical Feasibility	Widely used.	Thermal stress cracks; Long – term combustor reliability and performance issues

		Economic Feasibility		Cost of retrofit.
		Environmental Benefits	55% control efficiency for NOx.	
		Implementation Issues		
Repowering/replacement for simple cycle turbine		Technical Feasibility		
		Economic Feasibility		~$100 million to replace 200 MW.
		Environmental Benefits		
		Implementation Issues		As with most EGU's, the issue of grid reliability comes into play, especially with peaking units (primary reserve); peaking units only operate a limited amount of time each year but typically during the hottest days of the year because of peak energy demand. Long term strategy.
Wet electric static precipitator	For non-coal large boilers.	Technical Feasibility	Technology readily available.	
		Economic Feasibility		High capital, operating and maintenance cost.
		Environmental Benefits	99% control efficiency for PM.	EPA announced the elimination of the condensables portion of the PM2.5 from gas combusting units because are not representative of actual stack conditions. Therefore, this technology offers no real benefits for PM2.5 reductions. See link: http://www.epa.gov/ttn/chief/net/2002inventory.html

		Implementation Issues		
Municipal waste combustion		Technical Feasibility		Only a handful of MCW's in NJ and they all have SNCRs on them already.
		Economic Feasibility		
		Environmental Benefits		
		Implementation Issues		
Eliminate "peak shaving" from emergency generator definition	This applies to new generators.	Technical Feasibility		
		Economic Feasibility		
		Environmental Benefits		
		Implementation Issues		Prohibited by current regulations.
Flame temperature	Control flame temperature within a certain range to maximize flame temperature and minimize NOx emissions. This may be tied to other control measures instead of a stand-alone.	Technical Feasibility		
		Economic Feasibility		
		Environmental Benefits		
		Implementation Issues		

Biodiesel	Use of biodiesel blended with fuel oil. Most common and useful is the B20 (20% biodiesel).	Technical Feasibility	Seamless and transparent with existing petroleum infrastructure; Completely miscible with middle distillate fuel pool; High Cetane (50 vs 40); High Lubricity (good lubricant to be added fuel oil) ; BTU Content (128,000 Btu/gallon) comparable to kerosene; Cold Flow (5-7o F > for soy-based B20); Flash Point (>300oF vs 117o F); Technology already exists; Iowa has new rule that allows for B2 (2% biodiesel); 15-month storage life, although 6-month storage recommended; less boiler fouling.	About 10% lower heating value versus #2 oil.
		Economic Feasibility	Decreased dependence on petroleum imports; Developing new markets for agricultural products such as soybeans.	Will this take food away from feeding the hungry worldwide?
		Environmental Benefits	Reduced CO, HC, sulfur, PAH and PM exhaust emissions; Reduced health risks associated with diesel exhaust; Reduced greenhouse gas emissions; Safety – Health Effects tests confirm it is 10x less toxic than table salt, biodegrades as fast as sugar, and has no nitrogen or aromatics; Virtually sulfur free.	Possible small increase in NOx emission (Iowa test case has 1 engine with increase and the other with decrease in NOx).

		Implementation Issues	Test cases/studies nationwide, mostly mobile; NJDEP currently involved in stationary combustion source testing; tax credits or other incentives.	Need emission factors; Need more NJ research for stationary combustion sources.
Sulfur content in fuel oil	Change N.J.A.C. 7:27-9 so the statewide maximum sulfur content for #6 fuel oil would be 0.3% and for #2 fuel oil could be as low as 0.05%. Currently, some sources already burn these fuel oils.	Technical Feasibility	Simple to implement.	
		Economic Feasibility		May cause fuel price increase.
		Environmental Benefits	Would effect a wide universe of combustion sources in NJ.	
		Implementation Issues	Current regional efforts such as NESCAUM	Is there enough 0.05% #2 oil and 0.3% #6 oil?
Stack testing	Schedule stack testing outside of ozone season. Also, don't require stack testing unless the particular operating scenario occurs. For example, if a boiler is permitted to burn natural gas and #2 fuel oil but primarily burns natural gas 95% of the time, then stack testing burning #2 fuel oil only when it burns the oil during regular operation.	Technical Feasibility		Stack test should not be prohibited during ozone season. The test should, only, be required when/if operating during the particular scenario.
		Economic Feasibility		
		Environmental Benefits		
		Implementation Issues		Policy issue.
Co-fire landfill gas (LFG)	Give credits for burning landfill gas because this is reducing the amount of methane being emitted.	Technical Feasibility		
		Economic Feasibility		
		Environmental Benefits		
		Implementation Issues		

Distributed Generators (DG)	Use of cleaner small units to replace the larger, older, dirtier units.	Technical Feasibility		It would take many of these small controlled emergency generators at individual facilities to equal the generating capacity of a peaking unit.
		Economic Feasibility		
		Environmental Benefits	Small modern units may have as much as 93% less NOx emissions than older CTs	
		Implementation Issues		
SCR for emergency generators (DG)	Idea was that this could be a method of reducing demand during the hot summer days (high ozone days) from the peaking units. In a way, this is a form of distributed generation.	Technical Feasibility		It would take many of these small controlled emergency generators at individual facilities to equal the generating capacity of a peaking unit.
		Economic Feasibility	The cost is distributed to the individual facilities at a much small amount than controlling or replacing the entire peaking unit.	
		Environmental Benefits		
		Implementation Issues		Definition of “Emergency Generator” would need to be changed to allow for such usage (this may be restricted by current regulation). Current permit limits would likely need to be increased to accommodate “other than emergency” usage to mitigate peaking unit usage.

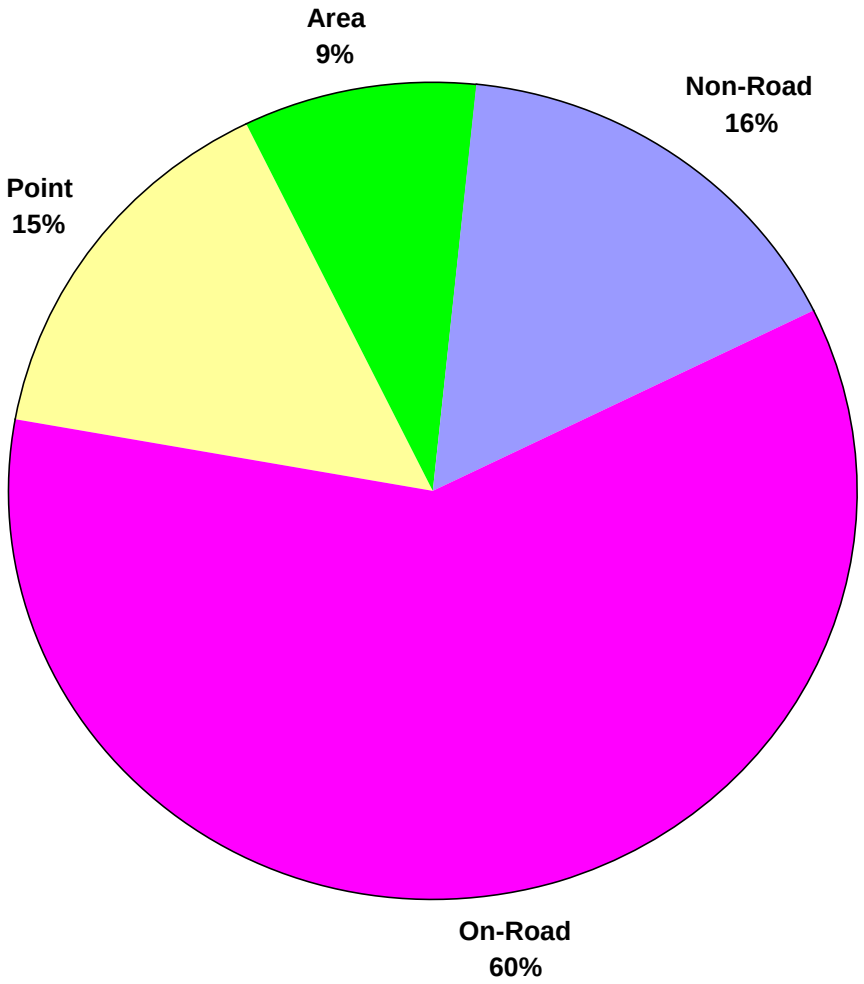
Refinery gas (RFG)	Emissions control on combustion of refinery gas. Most refinery gas used as fuel or flaring is currently controlled.	Technical Feasibility	RFG use as fuel is treated in an amine solution to remove H2S to comply with 40 CFR 60 Subpart J. Some permits have limits that even more restrictive than NSPS. Gases sent to a flare could be recovered for reuse.	Refineries already comply with NSPS requirements. RFG sent to flares is being addressed by EPA by enforcement actions and/or 114 consent decrees.
		Economic Feasibility	Some payback due to the value of the recovered material.	Gas recovery requires high capital investments ($15-20 MM for typical unit).
		Environmental Benefits		
		Implementation Issues		
Use of newer units over older units	Allow the use of newer, cleaner units over the use of older, dirtier units. The restriction may be regulations (federal and state) and permitting.	Technical Feasibility		
		Economic Feasibility		
		Environmental Benefits		
		Implementation Issues		Policy issue.
Light oil emulsification	Water emulsified fuel lowers peak flame temperatures to reduce “thermal NOx”.	Technical Feasibility		The test case in NJ was not successful, primarily due to turbine blade failures.
		Economic Feasibility		Higher CO2 emission.
		Environmental Benefits	~40% reduction in NOx.	
		Implementation Issues		
SCONOx	A single catalyst oxidizes nitric oxide (NO) to nitrogen dioxide (NO2), & then absorbs NO2 onto its surface, which is coated with potassium carbonate (K2CO3).	Technical Feasibility		Not commercially available on simple-cycle turbines; more expensive than SCR.

		Economic Feasibility		
		Environmental Benefits	90% to 95% reduction in NOx.	
		Implementation Issues		
XONON	A catalyst integrated into turbine combustors limits combustion temperatures & thermal NOx formation.	Technical Feasibility		Combustors are customized to the particular turbine by the original equipment manufacturer (OEM); Currently only commercially available from Kawasaki Gas Turbines-Americas on a small (1.4 MW) turbine
		Economic Feasibility		
		Environmental Benefits		
		Implementation Issues		
Restrict oil usage during ozone action days	This may be combined with other DEP initiatives to increase awareness, education, and communication.	Technical Feasibility		
		Economic Feasibility		
		Environmental Benefits		
		Implementation Issues		No guarantee on an uninterrupted supply of NG to replace fuel oil/diesel.
SNCR	Selective Non-Catalytic Reduction.	Technical Feasibility		Ammonia handling and storage.
		Economic Feasibility		
		Environmental Benefits	40% control efficiency for NOx.	Ammonia emissions.

		Implementation Issues		
Additional Retirement of NOx Allowances	Require the additional retirement of NOx allowances when dirty units are operated during the ozone action days. This is to discourage the use of dirtier units during the ozone action days.	Technical Feasibility		
		Economic Feasibility		
		Environmental Benefits		
		Implementation Issues		

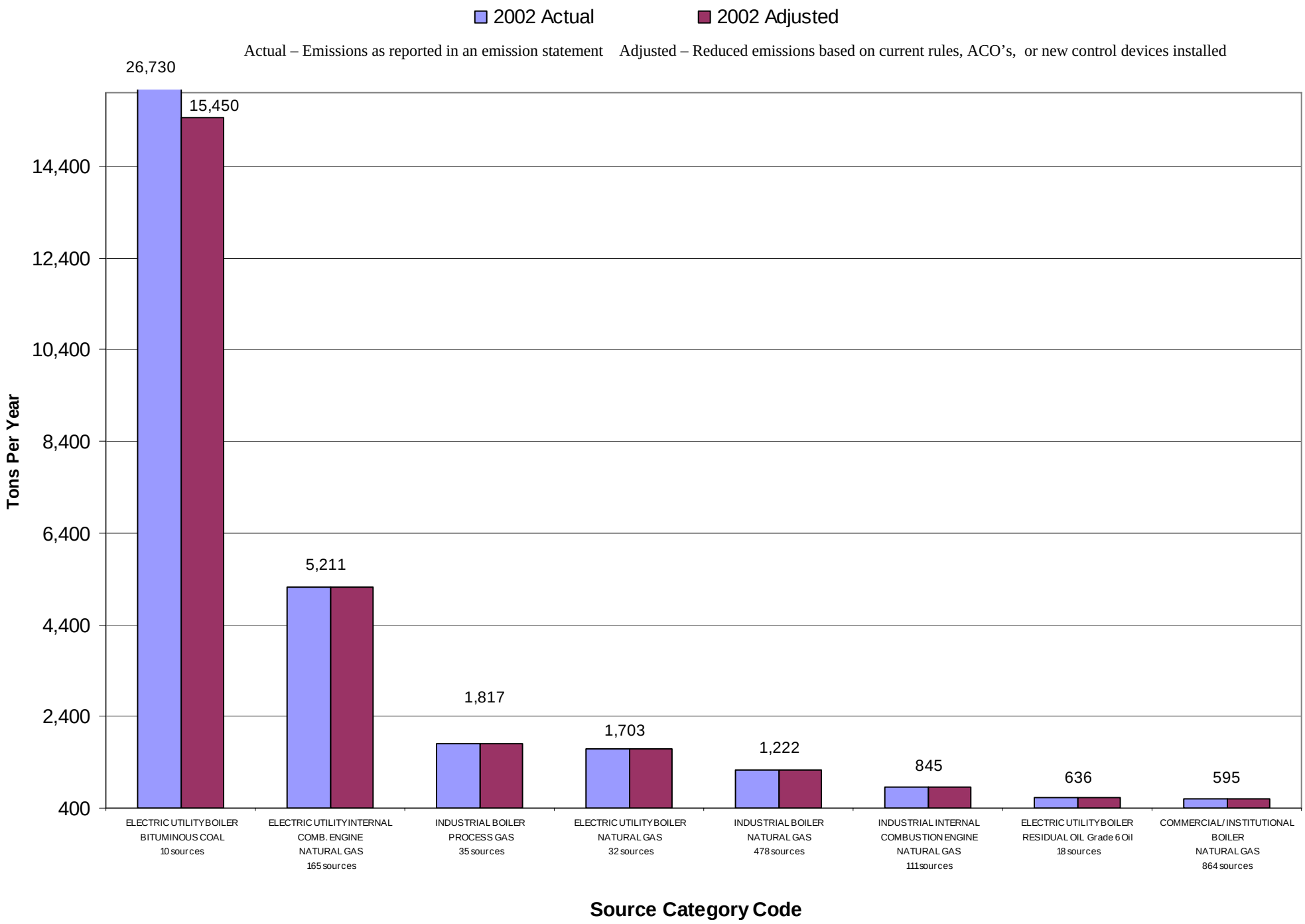
Appendix 3: Draft 2002 New Jersey Emissions Inventories

DRAFT 2002 New Jersey NOx Emissions by Sector

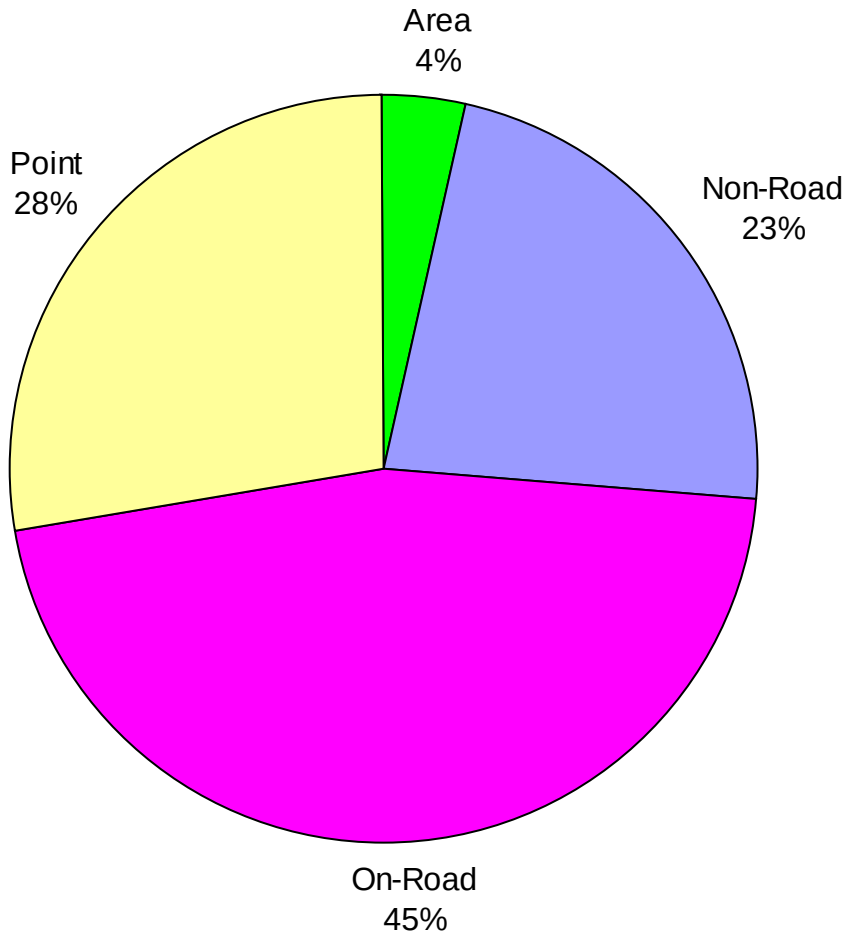


Total NOx Emissions - 283,767 tpy

Point Source NOx Emissions
2002 Actual vs 2002 Adjusted



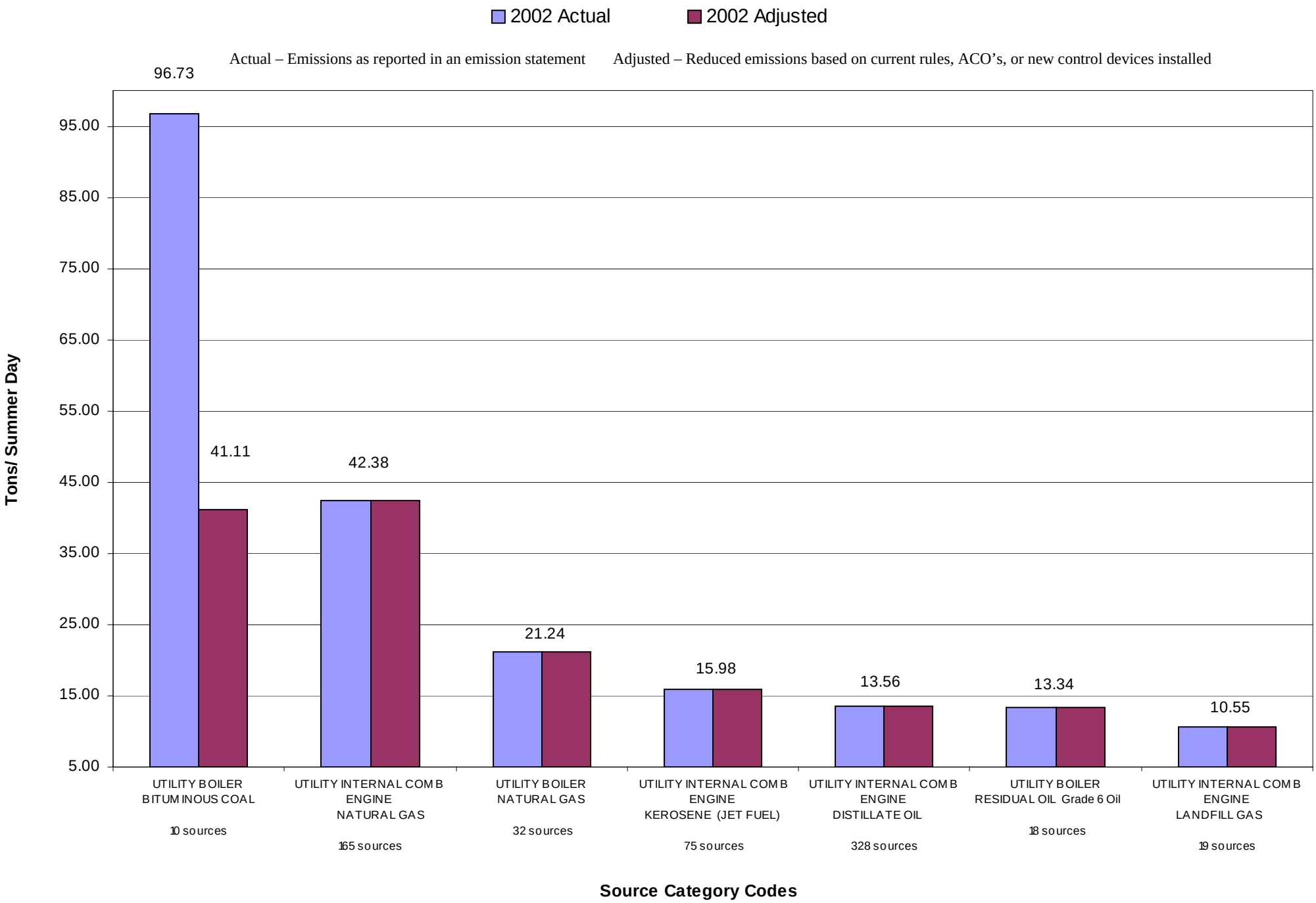
DRAFT 2002 New Jersey NO_x Emissions by Sector



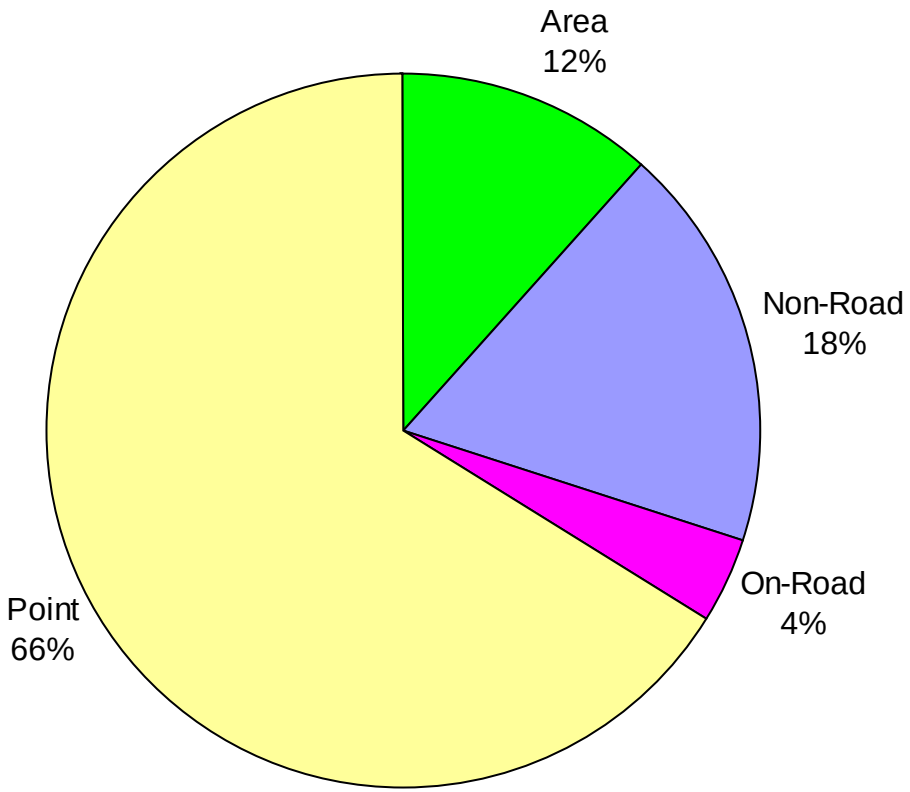
Total No_x Emissions - 1,009 tpd

(Anthropogenic sources only)

Point Source NOx Emissions
2002 Actual vs Adjusted

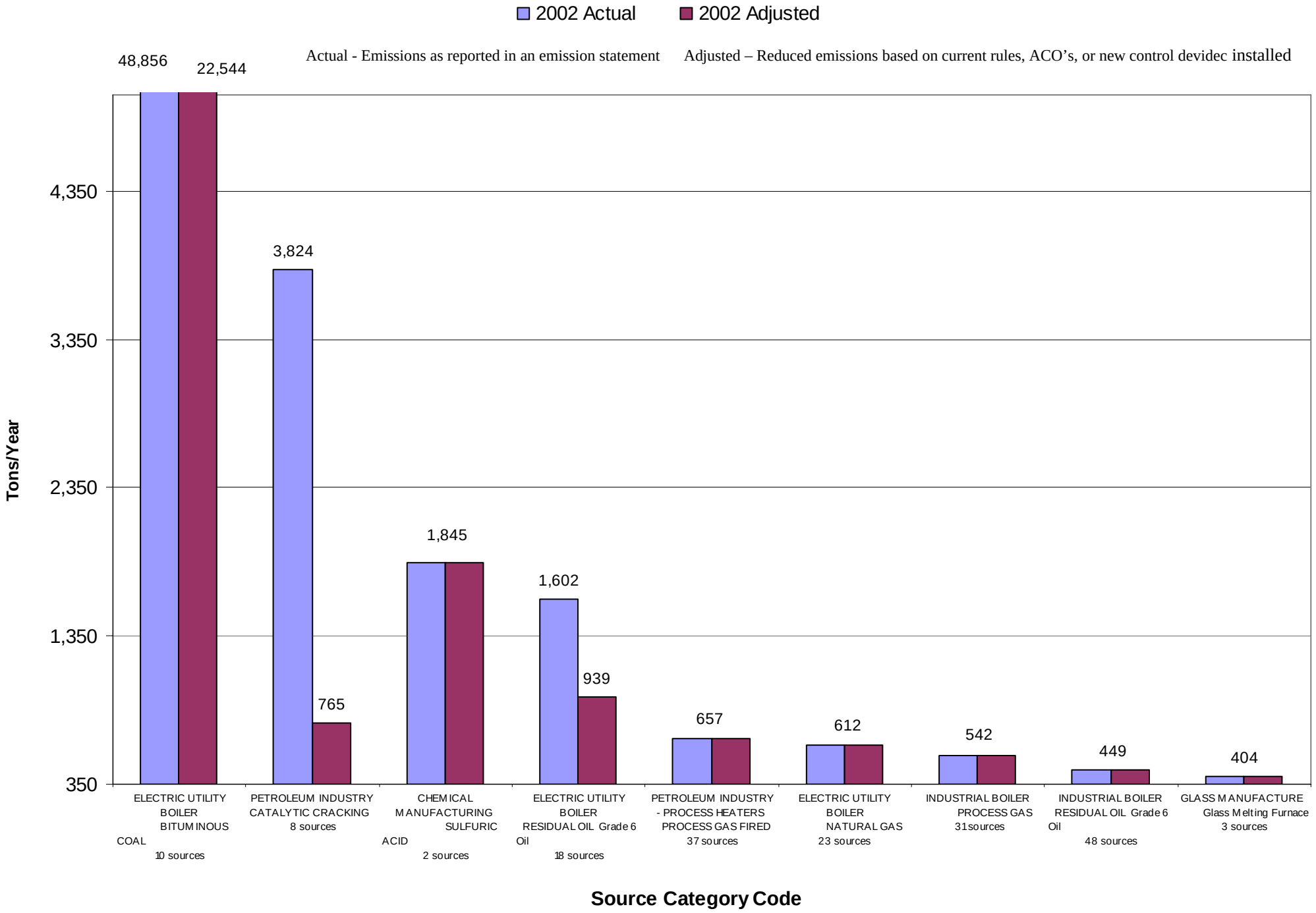


DRAFT 2002 New Jersey SO2 Emissions by Sector

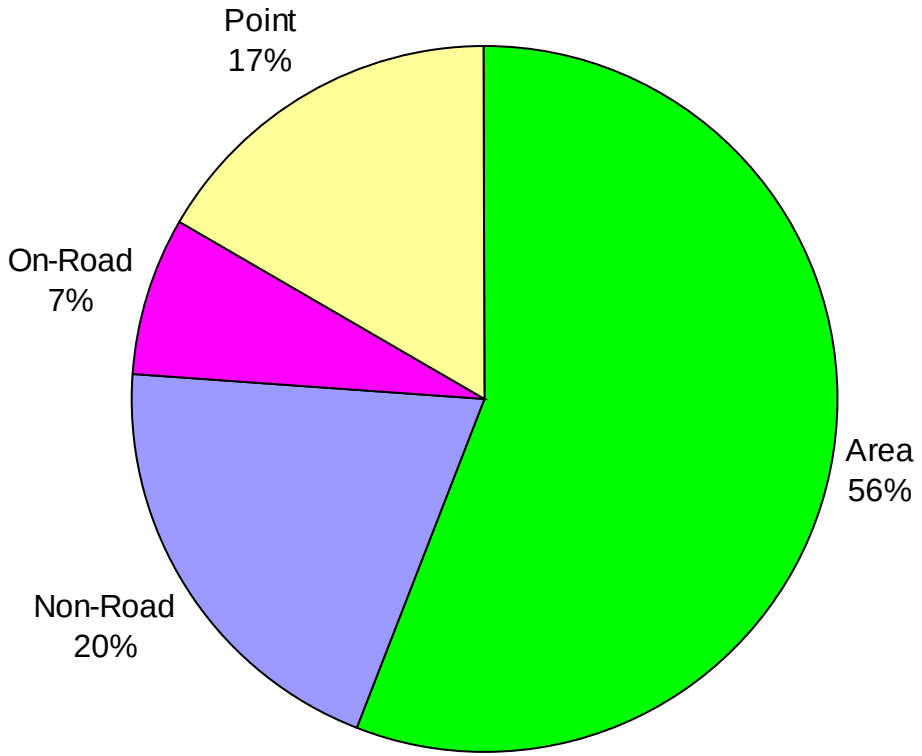


Total SO2 Emissions - 88,936 tpy

Point Source SO2 Emissions
Actual vs Adjusted



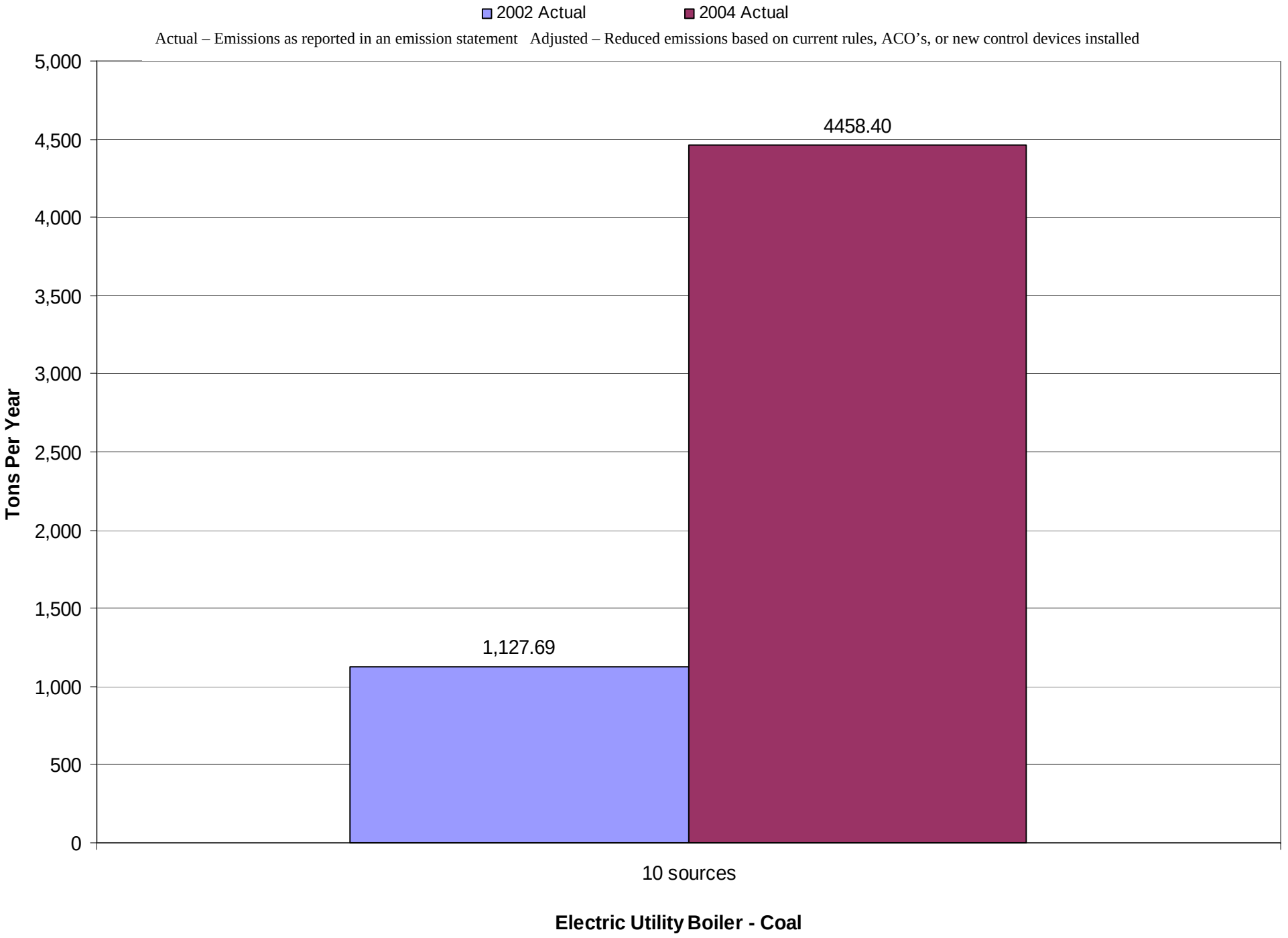
DRAFT 2002 New Jersey $PM_{2.5}$ Emissions by Sector



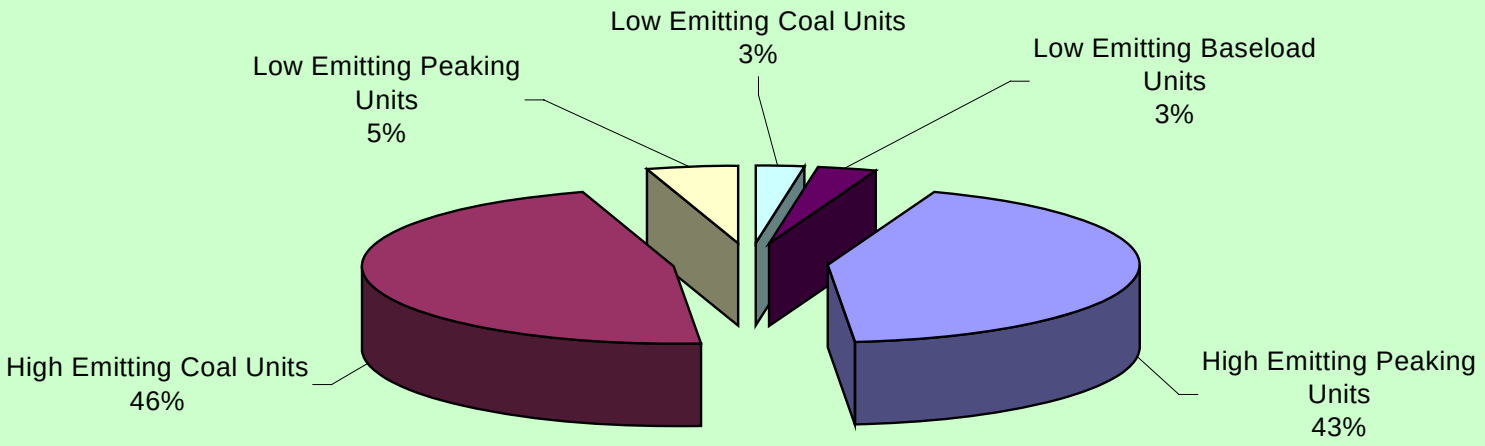
Total $PM_{2.5}$ Emissions - 29,103 tpy

(Includes Adjusted Fugitive Dust Emissions)

Point Source PM2.5 Emissions
2002 Actual vs 2004 Actual



NJ EGU NOx Emissions on August 14, 2002
PJM All-Time Electrical Generation Record

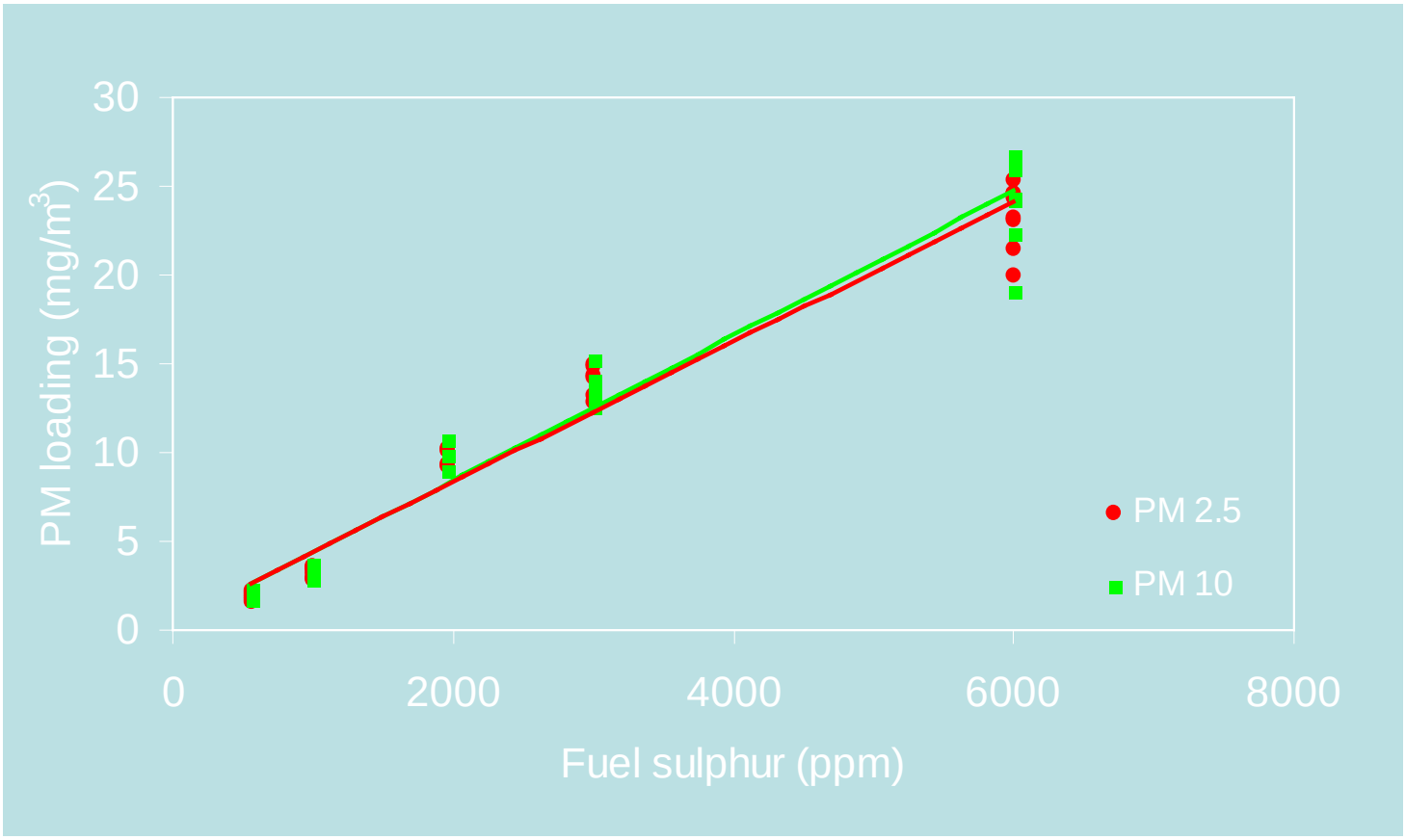


252.3 tons

More accurate estimates of PS HEPU emissions than on previous version.

Source: Brookhaven National Laboratory

Sulfur Impacts on PM $_{2.5}$ and PM$_{10}$



SUMMARY

Prepared by Peg Gardner
On Thursday, July 07, 2005

Stationary Combustion Sources Workgroup Meeting

Held June 29, 2005
Lower Lobby, Trenton War Memorial
Meeting called by: Yogesh Doshi
Facilitator: Peg Gardner
Attendees: Yogesh Doshi, NJDEP BPP; Rudy Maes, ESMI of NJ; James Connolly, Hoffman-LaRoche, Inc; Bill Vasil, Terranext; John Zaraycki, NJBPU OCE; Scott Hunter, NJBPU OCE; Brian Bahor, Covanta Projects Inc; Tim Porter, Wheelabrator; Luis A. Comas, Sunoco; Michael Tsakaloyannis, Clough Harbor Assoc; Christine Heath, Trinity Consultants; Fran Lindsley-Matthews, Chevron; Keith Ocheski, EnviroMet; Gary Napp, EnviroMet; Howard Ellis, Enviroplan; Anna M. Borillo, NJ Transit; Carleen Houston, FAA Tech. Center; Tom McNevin, NJDEP BAQP; John Hoertz, AFCEE/CCR-A; Kim McDonald, Air Force (McGuire Air Force Base); Kelly Moretta, Schering Plough Corp; Mark Caine, Bristol-Myers Squibb Co; Scott M. Conklin, Ocean Cty Utilities Authority; William Hizny, Enelhard Corp; Bill Corbin, Wheelabrator Gloucester; Tom Frankiewicz, Ozone Transport Commission; Arlene Borowsky, ENSR Int'l; Michael Cullen, PSEG – Hudson; Rich Bankowski, Rutgers University; Daniel Cunningham, PSEG; Gary Helm, Conectiv Energy; Kevin Harren, Valero Refining Co. Paulsboro; Richelle Wormley, NJDEP SREO; Melissa Evanego, NJDEP BAQP; Danny Wong, NJDEP BAQP; Peg Gardner, NJDEP BOP
Materials: Copy of Stationary Combustion Sources PowerPoint Presentation

Introduction/Announcements

All attendees introduced themselves and stated their affiliation i.e., NJDEP, electric generators, non-electric generators, consultants, and other government agencies.

Overview

Presented the group's mission statement, goals and deadline for recommendations; referred to new federal standards and implementation dates; set ground rules; discussed expectations for the workgroup and reactions to the workshop; Q & A with Bill O'Sullivan, talked about logistics (subgroups, communication, meetings, agenda items).

Discussion

Topic 1: Subgroups
Discussion: Formation of two subgroups, EGUs and non-EGUs
Group according to size (MMBtu/hr)
Benefits of staying together
Conclusion: Workgroup will remain intact.
Action Items/Person(s) responsible/Deadline: Not applicable

Topic 2: Mission Statement/Goals/Ground Rules
Discussion: Mission Statement - Recommend potential means to reduce/control emissions by September 30
Goals - Identify strategies, implementation issues & solutions, and other sources of data
Prioritize effective and efficient control measures
Groundrules - All ideas valid for consideration
Limit discussion to assigned to topic (stationary combustion sources)
Suggestions may include non-regulatory and non-traditional ideas as well as rule implementation
Avoid pending rules, ongoing litigation, site specific concerns, current federal standards, rules or policies
Other – Turn cell phone ringer "off"
Avoid acronyms
Introduce self before speaking
Conclusion: Refer to above discussion when necessary to stay on task
Action Items/Person(s) responsible/Deadline: Not applicable

Topic 3: Expectations/Reactions
Discussion: EPA 2.5 offsets
CAIR – SIP constraints (opportunity/penalty; bounds/economics)
How much reduction? Each sector?
Conclusion: rather be a "part of the process"
Action Items/Person(s) responsible/Deadline: Not applicable

Topic 4: Q & A with Bill O'Sullivan
Discussion: Total reductions needed? Determine from monitoring?
How much? Fair share?
Byproducts from new technology (SCR)
Conclusion: Correlation between reductions and monitoring data is not proportional; Areas of consideration
might include sulfur in fuel oil, NOx, VOC, indirect vs. direct, and turbines (peaking units); Recommendations should be effective and efficient.
Action Items/Person(s) responsible/Deadline: Not applicable

Topic 5: Logisitics
Discussion: Communications including e-mail, website, minutes, meetings and conference calls
Agenda – analysis of inventory (particularly any source peaks); combustion process; reduction strategies (BACT LAER/peaking units/Phase I CAIR)
Set up next meeting
Conclusion: List all group members; minutes will be written and posted on website and/or e-mailed to all
members; members may send alternates to meetings or may participate by phone; distribute inventories prior to next meeting; meetings to take place in Trenton from 9 to noon; next meeting
to be held on July 12, agenda to include analysis of inventory; combustion process; reduction strategies. Refer to Topic 2 discussion to stay on topic of interest.
Action Items/Person(s) responsible/Deadline: Minutes to be written by noon, Friday, July 1 by Peg Gardner; Yogesh Doshi shall set up the July 12 meeting; Danny Wong shall draw up list of group members; Melissa Evanego and Tom McNevin shall determine feasibility of distributing data prior to July 12.

Wrap-up

Next group meeting to be held Tuesday, July 12, from 9:00 – noon at DEP in Trenton. Tentative agenda shall include analysis of inventory to be presented by Melissa and Tom; combustion process (to be determined); potential reduction strategies led by Yogesh.

SUMMARY

Prepared by Peg Gardner
On Tuesday, August 16, 2005
Stationary Combustion Sources Workgroup Meeting
Held July 12, 2005
Station Plaza 4, 3rd fl, Conf. Rm 2
22 S. Clinton Ave, Trenton
Meeting called by: Yogesh Doshi
Facilitators: Peg Gardner
Danny Wong
Attendees: Yogesh Doshi, NJDEP BPP; Rudy Maes, ESMI of NJ; James Connolly, Hoffman-LaRoche, Inc; Richard Rao, Terranext; John Zarzycki, NJBPU OCE; Luis A. Comas, Sunoco; Fran Lindsley-Matthews, Chevron; Keith Ocheski, EnviroMet; Anna M. Borillo, NJ Transit; Tom McNevin, NJDEP BAQP; Kim McDonald, Air Force (McGuire Air Force Base); Kelly Moretta, Schering Plough Corp; Scott M. Conklin, Ocean Cty Utilities Authority; Arlene Borowsky, ENSR Int'l; Jon Perry, PSEG; Christine Neely, PSEG; Rich Bankowski, Rutgers University; Gary Helm, Conectiv Energy; Lisa Fleming, Vineland; Ted Gardella, USEPA; Milt Grundlock, Gloucester Cty Utility; Chris McClure, CHA; Manny Vizcaya, Air Engineering; Joe Carpenter, NJDEP DSRT; Melissa Evanego, NJDEP BAQP;Danny Wong, NJDEP BAQP; Peg Gardner, NJDEP BOP
Speaker Phone Participants: John Hoertz, USAF; Kyle Boudreaux, Florida Power & Light
Materials: Copies of day's agenda, PowerPoint Presentation(s) – 2002 Point Source Inventory, Ozone Season NOx Emissions

Introduction/Announcements

All attendees introduced themselves and stated their affiliation i.e., NJDEP, electric generators, non-electric generators, consultants, and other government agencies for the benefit of the new members; prefaced the inventory presentations by explaining the data is in draft form and has yet to be approved by EPA; the group as a whole voiced no objections to listing names and/or affiliations on the Air Workgroup website; report format is undecided.

Overview

Reviewed day's agenda; talked about logistics (next meeting, time, location); presented inventory data, possible control strategies and ozone season NOx emissions followed by Q & A; discussed potential ways to achieve emission reductions (NOx, SO2, VOC, PM2.5)

Discussion

Topic 1: 2002 Point Source Inventory
Discussion: PowerPoint presentation by Melissa Evanego based on emission statements
- 15% of Actual Annual NOx Emissions from Point Sources
- 28% of Actual Ozone Season NOx emissions from Point Sources
2003 NOx Budget Reductions not reflected
- 66% of Actual Annual SO2 Emissons from Point Sources
- 17% of Actual Annual PM2.5 Emissions from Point Sources
- Fuel Switch from #6 fuel oil, possible control strategy
- PM2.5 "Actual" emissions for 2002 not accurate when compared to 2004 Actual data (bad data?)
- Question to Industry on how a fuel switch would effect efficiency and cost of a unit
- Point source/Area source
Other: compliance testing yielding higher than expected PM-10 emissions; big picture/regional effort – other states
Conclusion: need realistic 2.5 data (no EPA-approved test method); incentive
Action Items/Person(s) responsible/Deadline: Not applicable
Topic 2: Potential Control Strategies

Discussion: PowerPoint presentation by Yogesh Doshi
Simple cycle turbine
- Selective catalytic reduction (SCR), water injection, dry low NOx burner (DLN), SOTA, replacement, aero-derivative (more efficient and SCR possible)
Combined cycle turbine – DLN & SCR
Non-coal large boilers – SCR & wet electric static precipitation (ESP)
Non-coal small boilers – SCR
Other: landfill gas (size?); municipal waste combustion (too few); summertime ozone days; global warming implications (regional greenhouse gas initiative – CO2, model draft)
Conclusion: DLN yields 6 – 8 ppm NOx; SCR results 80 – 90% NOx baseline reduction
Action Items/Person(s) responsible/Deadline: Not applicable
Topic 3: Ozone Season NOx Emissions
Discussion: PowerPoint presentation by Tom McNevin
- Avg Ratios of NOx Emissions on 5 Highest 8-Hour Ozone Days in 2001 to Seasonal Averages
- Avg Daily High-Emitting NJ Peaking Unit Operations on High and Low Temperature Days in 2002 Ozone Season
- August 2002: HEP NOx Emissions and Heat Input vs. Temperature Maxima
- August 2002: Number of HEP Units Operating vs. Temperature Maxima
- NJ EGU NOx Emissions on August 14, 2002 PJM All-Time Electrical Generation Record
- By percent / by numbers
- NJ EGU Projected NOx Emissions Post-2007 Using Operation Profile from All-Time Electrical Generation Record of August 14, 2002
- Conectiv NJ HEPU Emission Rates
- NJ EGU Stationary Source vs. Mobile Source NOx Emissions
- Additional slides???
Conclusion: 0.15 lb/MMBtu NOx; 90 high emitting peaking units (HEP); NOx trends – more power, same emissions.
Action Items/Person(s) responsible/Deadline: Not applicable
Topic 4: Open Discussion
Discussion: NY State's definition of boilers (RACT, NSPS)
Water injection (multimedia considerations – availability of water)
Eliminate "peak shaving" from emergency generator definition (NOx generation/NESCAUM Report)
Change demand (production schedules)
NOx reduction
Water injection
Flame temperature
Peakers – water injection (cost, effectiveness, reliability)
Fuel switching – price, availability, feasibility (gas pressure); seasonal; offsets
Biodiesel (shelf life)
Energy efficiency – reduce demand/usage
Sulfur content of fuel – cost
Stack testing – schedule outside ozone season; eliminate off cost (if not firing backup fuel)
Co-fire LFG – credits for existing boilers
Emergency generators with SCR – use as peaking units at industrial sites (byproducts)
Conclusion: Water injection, 30 – 40% reduction of NOx emissions from peaking units (need data regarding costs, reliability); more information required regarding use of biodiesel in stationary combustion sources (SCS); refer to groundrules to keep focus on SCS and goals of workgroup; other States' programs/std. may be useful.
Action Items/Person(s) responsible/Deadline: By 8/9 - Melissa Evanego will research fuel switching; Gary Helm and Jon Perry will present results of water injection on peaking units; Yogesh Doshi will research what other States are doing (rules, definitions, programs); Scott Conklin will report findings about biodiesel.

Topic 5: Logistics
Discussion: Set up next meeting (Aug. 9 or 10); time; place
Conclusion: Next meeting to be held on August 9. Meeting to take place in Trenton at 22 S. Clinton Ave, 3rd floor, conference room 2, from 9 to noon.
Action Items/Person(s) responsible/Deadline: Yogesh Doshi shall set up the August 9 meeting.
Wrap-up: None

SUMMARY

Prepared by Danny Wong
On Tuesday, August 16, 2005
Stationary Combustion Sources Workgroup Meeting
Held August 9, 2005
401 E. State St., Trenton
Public Hearing Room
Meeting called by: Yogesh Doshi
Facilitator: Danny Wong
Attendees: Yogesh Doshi, NJDEP BPP; Rudy Maes, ESMI of NJ; James Connolly, Hoffman-LaRoche, Inc; Luis A.Comas, Sunoco; Fran Lindsley-Matthews, Chevron; Keith Ocheski, EnviroMet; Kelly Moretta, Schering PloughCorp; Scott M. Conklin, Ocean Cty Utilities Authority; Arlene Borowsky, ENSR Int'l; Jon Perry, PSEG; Christine Neely, PSEG; Rich Bankowski, Rutgers University; Gary Helm, Conectiv Energy; Ted Gardella, USEPA; Milt Grundlock, Gloucester Cty Utility; Joe Carpenter, NJDEP DSRT; Melissa Evanego, NJDEP BAQP; Danny Wong, NJDEP BAQP; Matt Zehr, NJDEP SRO; Serpil Guran, NJDEP DSRT; Karen Nowicki, AEANJ; John Hoertz, USAF; Christine Heath, Trinity Consultants; Howard Ellis, Enviroplan; Mark Caine, Bristol-Myers Squibb Co.
Speaker Phone Participants: Tom McNevin, NJDEP BAQP; Kyle Boudreaux, Florida Power & Light
Materials: Copies of day's agenda, PowerPoint Presentation(s) – Biodiesel, Total NJ EGU NOx Emissions on Actual 8/14/02, Further Breakdown of Inventory, NOx Reduction Project, NOx Reduction Technologies

Introduction/Announcements

All attendees introduced themselves and stated their affiliation i.e., NJDEP, electric generators, non-electric generators, consultants, and other government agencies for the benefit of the new members; prefaced the inventory presentations by explaining the data is in draft form and has yet to be approved by EPA; the group as a whole voiced no objections to listing names and/or affiliations on the Air Workgroup website; report format is undecided.

Overview

Reviewed minutes from last meeting, reviewed day's agenda; presented inventory data, EGU control information (by industry), biodiesel; Breakout Groups to further discuss EGU, biodiesel, and fuel switching; talked about logistics (next meeting, time, location).

Discussion

Topic 1: Peaking Turbine Control Measures

Discussion: PowerPoint presentation by John Perry
- Types of EGU's – baseload, load-following, and peaking
- Load curves
- Congestion management
- List of PSE&G's peaking turbines and capacity factors
- Retired units
- PSE&G's emission trend
- Control options – SCR, DLNC, LOE, SCONOx, XONON, Water Injection, Repowering/Replacement

Other: suggestions of other areas for investigation and what other states have implemented
Conclusion: some of the control options may not be economically feasible; federal/state regs need to allow the use of newer, cleaner units in place of the older, dirtier units
Action Items/Person(s) responsible/Deadline: Not applicable

Topic 2: Water Injection

Discussion: PowerPoint presentation by Gary Helm

- Project history & objectives
- Principles of operation
- Major equipment/components
- Engineering challenges
- NOx emissions reductions
- Cost estimates

Conclusion: Most cost effective for getting NOx reduction for the listed units

Action Items/Person(s) responsible/Deadline: Not applicable

Topic 3: Further Breakdown of Inventory

Discussion: PowerPoint presentation by Melissa Evanego
- Refinement of inventory data presented from the 7/12/05 meeting
- SO2 and NOx pie chart of point sources

Conclusion: Possible control measures drawn from this data – fuel switching, lowering S% in fuel, refinery gas control.

Action Items/Person(s) responsible/Deadline: Not applicable

Topic 4: Fuel Switching

Discussion: PowerPoint presentation by James Connolly
- Scope of main energy operations
- Energy center operation
- 5 Year boiler energy profile – average 77% natural gas, 23% oil
- #6 Fuel oil use vs. allowable (use of 1.1 million gallons, permitted to burn 4.2 million gallons)
- #6 oil primarily used when temperature drop below 20°F
- Emissions reduction
- Cost to switch based on real data

Conclusion: Cost to switch is too much for this facility

Action Items/Person(s) responsible/Deadline: Not applicable

Topic 5: Controls Implemented in Other States

Discussion: Short discussion led by Yogesh Doshi

Conclusion: There are many efforts in developing control measures in California and regional organizations (NESCAUM, OTC, MARAMA, etc.)

Action Items/Person(s) responsible/Deadline: Not applicable

Topic 6: Controls Implemented in Other States

Discussion: Graphs by Tom McNevin, presented by Danny Wong
- Updated data for NOx emissions from EGU's on 8/14/02
- Data accounted for recent and future unit retirements, regulatory actions, enforcement actions, etc.

Conclusion: High emitting peaking units will still constitute ~50% of NOx emissions during the ozone season

Action Items/Person(s) responsible/Deadline: Not applicable

Topic 7: Biodiesel

Discussion: PowerPoint presentation by Serpil Guran
- Overview of fine particulate matter
- What is biodiesel
- B100, B5, B20
- Basic production technology
- Properties & attributes
- Benefits of biodiesel – reduced emissions, decrease dependence on oil, new agricultural market, lubricity when added to oil
- Could biodiesel be a fuel source for stationary internal combustion engines?
- Test cases & studies
- Rowan University – 3 school buses
- Iowa – 1972 Cooper and 1999 Caterpillar
- Brookhaven National Laboratory

- Storage studies – Europe

Conclusion: Biodiesel is a viable fuel source in reducing emissions

Action Items/Person(s) responsible/Deadline: Not applicable

Topic 8: Breakout Groups

Discussion: Summary reports by the three groups

- EGU's

• Pratt and Whitney FT4 - Aeroderivatives

There are about 35 such simple cycle turbines in NJ, which are not equipped with any kind of NOx control such as water injection. Water injection is technically feasible NOx control technology on this type of turbines. There are over 40 such turbines in NJ, which are equipped with water injection.

PROS: Water Injection has the potential to reduce about 40% NOx emissions; Each engine roughly operates about 12 hours per day during hot summer days; Based on existing actual emission data, each engine can reduce about 0.5 tons of NOx per day; Overall, this technology has the promise of reducing 35 tons of NOx per ozone day.

CONS: Equivalent amount of higher CO emissions; annualized cost of about $44,000 per ton of NOx reduction (Presentation by Conectiv)

• LM6000 - Aeroderivatives & GE - 7EA - Large Industrial Frame type turbines

There are about 4 GE 7EA simple cycle turbines in NJ. Similar simple cycle turbines in CA are equipped with SCR. The use of SCR is possible due to addition of dilution air to bring the exhaust temperature within catalyst operating range.

PROS: SCR has the potential to reduce 75 – 80% NOx emission; Each engine has the potential to reduce about 0.25 tons of NOx per day; Overall it can reduce up to 1 ton of NOx per day

CONS: Exorbitantly high cost to install SCR for very small reduction; Higher CO emissions; Lower efficiency and hence higher greenhouse gas emissions

• Large Commercial Boilers:

Workgroup expressed concern that there may be industrial and commercial size boilers greater than 100 MMBTU per hour, which may not be equipped with Low-NOx burners.

The Department indicated that NOx RACT rule requires LNB on all such boilers.

• Other Issues/concerns:

The Department should restrict fuel oil use during ozone days (hot summer days), provide additional flexibility (calendar year v/s 365 days rolling) for relatively cleaner units, mandatorily restrict the use of air conditioning by setting higher temperature during hot summer/ozone days (this should be done for large office and industrial buildings), promote tax incentives or financial incentives to cover the cost of new technology

Overall consideration should also be given to balance the need of energy and environment.

- Biodiesel

• Potential viable fuel source
• Widely used in Europe
• Emissions reduction – PM2.5, CO, HC, PAH
• Need emission factors
• Need more NJ research on ULSD+B20 and test cases

- Fuel Switching

• #6 oil to # 2 oil

Cost of switching includes retrofit and clean up
Supply of #2 (not enough) and #6 (excess)
Retrofit may trigger NSR, SOTA, etc.
Less emissions (NOx, SO2, CO2, etc.) which also means less emissions fees
Lower maintenance cost, including no tank heaters, less boiler foul up, etc.

• set entire state of NJ to 0.3% sulfur for #6 oil
• set entire state of NJ to 0.05% sulfur for #2 oil
• what other states' sulfur % is

• incentives for switching
• need more education/assistance for smaller facilities
• fuel price dictates type of fuel used
• allow the use of newer, cleaner units in place of the older, dirtier units

Others: More refinement of inventory

Conclusion: Need to weigh pros & cons, implementation issues, cost, and amount of reduction

Action Items/Person(s) responsible/Deadline: Not applicable

Topic 9: Logistics

Discussion: Set up next meeting (September 13); time; place

Conclusion: Next meeting to be held on September 13. Meeting to take place in Trenton at 401 E. State St., Trenton, in the Public Hearing Room, from 9am to 12pm.

Action Items/Person(s) responsible/Deadline: Yogesh Doshi shall set up the September 13 meeting.

Wrap-up: Task for next meeting (draft report), white papers, parking lot issues

SUMMARY

Prepared by Peg Gardner
On Tuesday, September 27, 2005
Stationary Combustion Sources Workgroup Meeting
Held September 13, 2005
401 E. State St., Trenton
NJDEP 7th Fl Large Conference Room
Meeting called by: Yogesh Doshi
Facilitators: Peg Gardner and Danny Wong
Attendees: Yogesh Doshi, NJDEP BPP; James Connolly, Hoffman-LaRoche, Inc; Luis A. Comas, Sunoco; Keith Ocheski, EnviroMet; Kelly Moretta, Schering Plough Corp; Scott M. Conklin, Ocean Cty Utilities Authority; Jon Perry, PSEG; Rich Bankowski, Rutgers University; Gary Helm, Conectiv Energy; Ted Gardella, USEPA; Joe Carpenter, NJDEP DSRT; Ronald Jackson, NJBPU; Melissa Evanego, NJDEP BAQP; Danny Wong, NJDEP BAQP; Matt Zehr, NJDEP SRO; Karen Nowicki, AEANJ; Mark Caine, Bristol-Myers Squibb Co.; Tom McNevin, NJDEP; Pat Kittikul, Hess Oil; James Connolly, Hoffman-LaRoche; Al Hatton, ERM; Dan Cunningham, PSEG; Sarah Woo, Fort Dix (US Army); Peg Gardner, NJDEP
Speaker Phone Participants: Kyle Boudreaux, Florida Power & Light
Materials: Copies of day's agenda, preliminary draft (if available before the meeting), completed feedback survey

Refreshments / Introduction / Announcements

All attendees introduced themselves and stated their affiliation i.e., NJDEP, electric generators, non-electric generators, consultants, and other government agencies for the benefit of the new members; SIP deadlines; short term/long term strategies; regional efforts; report template; white papers; Appreciation Day, Nov. 14

Overview

Reviewed minutes from last meeting; changed morning's agenda; explained "rough" preliminary draft report; reported on DEP assignments (summaries of break-out group discussions and most recent list of potential control measures); evaluated control measures according to best potential for reductions; reviewed latest EGU data from AQPP; heard overview of BPU programs; talked about logistics (next meeting, time, location).

Discussion

Topic 1: Workgroup Report
Discussion: "Rough" Preliminary Draft Report
- Workgroup (Name, Leader, State Team Members, Non-state Members)
- Executive Summary
- Introduction – why?
  – inventory tables, charts
- Purpose and Goals – website
- Workgroup Prioritization
- Structure of Workgroup
- Summary of Meetings/Data
- Initial Control Measure Considerations – PowerPoint Presentations
  – List of Potential Control Measures
- Detailed Review of Promising Control Measures – Break-out Groups' Discussions
- Summary of "Parking Lot" and Crossover Issues
- Comments
- References

Other: the members expressed no interest in pursuing distribution generators.
Conclusion: group will review preliminary draft at next meeting

Action Items/Person(s) responsible/Deadline: Peg Gardner will write the report; summaries will be submitted by discussion groups' leaders (Danny Wong and Melissa Evanego – fuel switching; Yogesh Doshi – EGUs; Serpil Guran, if available – biodiesel) by close-of-business Monday, September 26.

Topic 2: List of Potential Control Measures

Discussion: Prioritization of potential control measures

• Take back to home/office to rank

• Discuss and prioritize at meeting (most favorable to least favorable; effective and efficient – list missing information; assign quadrant ranking I, II, III, or IV; popular decision – each member gets five votes)

Conclusion: By popular decision, the top five areas recommended for further consideration are: 1) water injection for gas turbine peaking units; 2) biodiesel fuel; 3) low sulfur fuel; 4) fuel switching (#6 to #2); and 5) allow use of newer, cleaner units over older, dirtier units.

Action Items/Person(s) responsible/Deadline: Not applicable

Topic 3: Further Breakdown of Inventory

Discussion: Handouts by Tom McNevin

- Refinement of EGU NOx Emissions
- NOx bar graphs for projected emissions and accompanying pie charts of point sources

Conclusion: Projections show NOx emission reduction up to 60% from EGUs

Action Items/Person(s) responsible/Deadline: Not applicable

Topic 4: Overview BPU/DEP Programs

Discussion: Informal discussion led by John Zarzycki, Ronald Johnson, and Joe Carpenter

- CHP (fuel cells, microturbines/gas engines)
- Rebates (high energy)
- Renewable Energy (2008, 6 1/2% renewable)
- Rebates (up to 70% installed)
- Renewable Energy Certificate
- Emissions reduction
- Cost to switch based on real data

Conclusion:

Action Items/Person(s) responsible/Deadline: Not applicable

Topic 5: Feedback Survey

Discussion: Short discussion led by Melissa Evanego

Conclusion:

Action Items/Person(s) responsible/Deadline: Bring completed form to next meeting

Topic 6: Logistics

Discussion: Set up next meeting; time; place

Conclusion: Next meeting to be held on September 27. Meeting to take place in Trenton at 401 E. State St., Trenton, in the 7th floor Large Conference Room, from 9am to 12pm.**

Action Items/Person(s) responsible/Deadline: Yogesh Doshi shall set up the September 27 meeting.

Wrap-up: Tasks for next meeting (read preliminary draft report, complete and return feedback survey, submit white papers by October 7)

** NOTE: The location of this meeting has been changed to 170 West State Street, Trenton 08608 at the PSEG Governmental Affairs Office.

SUMMARY

Prepared by Peg Gardner
On Friday, October 28, 2005

Stationary Combustion Sources Workgroup Meeting

Held September 27, 2005
170 W. State St., Trenton, NJ 08608
PSEG, Governmental Affairs Office
Meeting called by: Yogesh Doshi
Facilitator: Peg Gardner

Attendees: Yogesh Doshi, NJDEP BPP; Rudy Maes, ESMI of NJ; James Connolly, Hoffman-LaRoche, Inc; Luis A. Comas, Sunoco; Fran Lindsley-Matthews, Chevron; Scott M. Conklin, Ocean Cty Utilities Authority; Jon Perry, PSEG; Rich Bankowski, Rutgers University; Joe Carpenter, NJDEP DSRT; Melissa Evanego, NJDEP BAQP; Mark Caine, Bristol-Myers Squibb Co; John Zarzycki, NJBPU; Peg Gardner, NJDEP BOP; Tom McNevin, NJDEP BAQP; Chris McClure, Clough Harbour & Associates; Al Hatton, ERM; Pat Kittikul, Hess Oil Refinery; Anna Borillo, NJTransit
Speaker Phone Participants: None
Materials: Copies of day's agenda, feedback survey, preliminary draft report

Introduction/Announcements

All attendees introduced themselves and stated their affiliation i.e., NJDEP, electric generators, non-electric generators, consultants, and other government agencies; report format is template being used by all workgroups; feedback survey for SCS Workgroup

Overview

Reviewed minutes from last meeting; reviewed day's agenda; reviewed preliminary draft report; distributed feedback survey to participants; talked about logistics (next meeting, time, location).

Discussion

Topic 1: Preliminary Draft Report
Discussion: several summaries merged into one document; improvements to preliminary report

- Workgroup (Name, Leader, State Team Members, Non-state Members)
  Spell out meaning of acronyms; list names in column; add Al Hatton, ERM
- Executive Summary
  Overall effort; other members of regulated community; move up low sulfur fuel from third place to second (biodiesel may be longer term goal); add "combustion" and "operational flexibility " to control measure 5)
- Introduction
  Work out language
- Purpose and Goals
  Regional haze? Remove "no interest" with regard to white papers
- Structure of Workgroup
  "Rejected" too harsh; stay together
- Summary of Meetings/Data
  9/13 meeting (collective, chose for further consideration/evaluation); attach meeting summaries
- Initial Control Measure Considerations
  Correct lettering of subheadings (A,B,C)
  A. Presentations; informative; collectively triggered discussion
  B. Did not discuss social benefits/EJ (remove)
  C. No comments/changes

- Detailed Review of Promising Control Measures
  Renumber 1 – 5 to match control measures in the Executive Summary
  1. Water Injection – relevancy of nuclear reactors; list pollutants reduced through enforceable agreements for coal-fired boilers; turbines (simple vs. combined, quick-start capability, grid stabilization, generic "such as", delete SCR)
  2. Low Sulfur fuel – remove research language; rule change; minimal cost (not prohibitive)
  3. Add Biodiesel
  4. Fuel Switching – add sentence to introduction; hypothetical (refer to presentation), simplify
  5. Use of newer, cleaner over older, dirtier units – Provide summary
- Summary of "Parking Lot" and Crossover Issues
  Elaborate/provide details; delete distributed generation
- Comments
  Elaborate/provide details
- References
  Elaborate/provide details
- White Papers (John Zarzycki, NJBPU and Jon Perry, PSEG may submit)
- Appendices
  List of Suggestions Outside Scope of the Workgroup – add last page of PSEG presentation (Dan Cunningham's comments)

Conclusion: Pare down report

Action Items/Person(s) responsible/Deadline: Water injection and permit flexibility summaries/ Yogesh Doshi; draft report due to NJDEP management for review by October 7/Peg Gardner; final report due October 31/Peg Gardner.

Topic 2: Logistics

Discussion: Next meeting is to be held on November 14 at 401 E. State Street in the Public Hearing Room to present the Workgroup's recommendations to NJDEP management

- PowerPoint presentation
- Q & A
- Recognition/ Certificates of Appreciation for active participants

Conclusion: Not applicable

Action Items/Person(s) responsible/Deadline: Not applicable

Wrap-up: Complete and return Feedback Survey; Tasks before October 7 (provide comments regarding revised draft report; submit white papers for inclusion in draft report); Thanks to Jon Perry for hosting meeting

Wrap-up: Task for next meeting (draft report), white papers, parking lot issues

Appendix 5: List of all Data Reviewed by the Workgroup

1. "Stationary Combustion Sources." Reducing Air Pollution Together, New Jersey Department of Environmental Protection. June 29, 2005. [http://www.nj.state.gov/dep/airgroups/combustion_workgroup.html], accessed September 29, 2005.

2. "Inventory Data." Stationary Combustion Sources Workgroup, Reducing Air Pollution Together, New Jersey Department of Environmental Protection. July 12, 2005. [http://www.nj.state.gov/dep/airgroups/combustion_workgroup.html], accessed September 29, 2005.

3. "EPA's Compiled EDR Data for the 2001 and 2002 Ozone Seasons." Stationary Combustion Sources Workgroup, Reducing Air Pollution Together, New Jersey Department of Environmental Protection. July 12, 2005. [http://www.nj.state.gov/dep/airgroups/combustion_workgroup.html], accessed September 29, 2005.

4. "Updated Inventory Data." Stationary Combustion Sources Workgroup, Reducing Air Pollution Together, New Jersey Department of Environmental Protection. July 12, 2005. [http://www.nj.state.gov/dep/airgroups/combustion_workgroup.html], accessed September 29, 2005.

5. "The Breakdown of EGU Emissions." Stationary Combustion Sources Workgroup, Reducing Air Pollution Together, New Jersey Department of Environmental Protection. July 12, 2005. [http://www.nj.state.gov/dep/airgroups/combustion_workgroup.html], accessed September 29, 2005.

6. "Presentation by Conectiv on Water Injection." Stationary Combustion Sources Workgroup, Reducing Air Pollution Together, New Jersey Department of Environmental Protection. August 9, 2005. [http://www.nj.state.gov/dep/airgroups/combustion_workgroup.html], accessed September 29, 2005.

7. "Presentation by PSEG on EGU Operations and Controls." Stationary Combustion Sources Workgroup, Reducing Air Pollution Together, New Jersey Department of Environmental Protection. August 9, 2005. [http://www.nj.state.gov/dep/airgroups/combustion_workgroup.html], accessed September 29, 2005.

8. " Presentation by Hoffmann-LaRoche on Fuel Switching for a Small Boiler." Stationary Combustion Sources Workgroup, Reducing Air Pollution Together, New Jersey Department of Environmental Protection. August 9, 2005. [http://www.nj.state.gov/dep/airgroups/combustion_workgroup.html], accessed September 29, 2005.

9. "Overview on Biodiesel and Test Cases." Stationary Combustion Sources Workgroup, Reducing Air Pollution Together, New Jersey Department of Environmental Protection. August 9, 2005. [http://www.nj.state.gov/dep/airgroups/combustion_workgroup.html], accessed September 29, 2005.

10. "Updated Data for the Breakdown of EGU Emissions." Stationary Combustion Sources Workgroup, Reducing Air Pollution Together, New Jersey Department of Environmental Protection. August 29, 2005. [http://www.nj.state.gov/dep/airgroups/combustion_workgroup.html], accessed September 29, 2005.

Appendix 6: List of Suggestions Outside the Scope of the SCS Workgroup's Evaluation

1. Restrict air conditioning by setting controls at a higher temperature during hot summer/ozone days for large office and industrial buildings.
2. Airport NOx emissions
3. Electrification of truck stops
4. Port Elizabeth, Port Newark
5. Ferries